932036

Duke Engineering & Services SM
A Duke Energy Company

Feasibility Study for the Remediation of the Former Carborundum Company – Electric Products Division, Hyde Park Facility, Town of Niagara, Niagara County, New York
SITE NO. 932036

FINAL DOCUMENT

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Project No.: TM4085

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EXECUTIVE SUMMARY

The former Carborundum Company's Hyde Park facility ("site") in Niagara Falls is listed on the New York State Department of Environmental Conservation's (NYSDEC's) list of Inactive Hazardous Waste Disposal Sites. The site, which is classified as a Class 2 site, is identified as Site No. 932036. A Class 2 site is defined as a site that poses a significant threat to the public health or the environment and one that requires mitigative action.

The Carborundum Company was required by an NYSDEC Order on Consent (INDEX# B9-0454-94-04) to conduct a remedial investigation/feasibility study (RI/FS) of the site. BP America retained the environmental liability associated with the site during the acquisition of the Carborundum Company and subsequent sale of the subject property. DE&S was retained by BP America to undertake the RI/FS.

The purpose of the RI/FS is to develop and implement a cleanup program that will allow the removal of the site from the NYSDEC's list of hazardous waste disposal sites. Volatile organic compounds (VOCs) have been detected in soils and groundwater on the site at concentrations that exceed NYSDEC Soil Cleanup Objectives and/or Groundwater Standards/Criteria. The VOCs of concern at the site include trichloroethylene and its breakdown products. In addition, one small area of the site near the railroad spur contains soils with polycyclic aromatic hydrocarbon (PAH) concentrations above NYSDEC Soil Cleanup Objectives.

Groundwater flow in the vicinity of the former Carborundum Company facility is toward the southwest in both the bedrock and the shallow overburden. Two USEPA hazardous waste sites as well as numerous other industrial sites are located upgradient of the former Carborundum Company property. Concentrations of some contaminants detected in upgradient areas are lower than those detected on the former Carborundum Company facility, and some upgradient wells on the Carborundum property are located near sources of on-site contamination. However, the identification of groundwater contamination in wells upgradient of the site indicates that groundwater contamination on the former Carborundum Company site may be at least partially

due to offsite or upgradient sources. The extent of potential off-site groundwater contamination has not been defined. Additional data must be collected to better determine the potential impact of upgradient sites on the former Carborundum Company property.

The Risk Assessment conducted during the RI concluded that contaminant levels in soil and groundwater do not pose an immediate threat to human health or the environment. This conclusion was drawn based on site-specific data and on the fact that contaminants in groundwater are located greater than five feet below ground surface, and most of the ground in the area is covered in asphalt or concrete, which acts as an additional barrier to potential exposure.

The remedial action objectives developed to address soil and groundwater contamination on the site include:

1. Remove contaminants from on-site soils to meet NYSDEC Soil Cleanup Objectives. This was achieved through remediation of soils and removal of the on-site source of shallow groundwater contamination during execution of an interim remedial measure (IRM) at the site.

2. Reduce contaminant concentrations in groundwater in the short-term. Ultimately, the objective is to remediate contaminated groundwater to meet NYSDEC Groundwater Standards/Criteria. The short-term objective will likely be attained through removal of the source of on-site contamination conducted during the IRM. This is considered a reasonable objective that will create a reduction in contaminant concentrations with time in the immediate vicinity of the site, particularly in shallow groundwater in the overburden. This objective for groundwater meets the goal of ensuring continued protection of human health and the environment and attaining an overall reduction in groundwater contaminant concentrations with time.

The recommended remedial alternative for soil is excavation of contaminated soils from the site and off-site disposal at RCRA approved Part 360 and 373 landfills. This alternative was implemented during execution of an interim remedial measure (IRM) to remediate contaminated soils at the site. By removing contaminated soils from the site, identified sources of potential groundwater contamination were removed from the former Carborundum Company property.

Two major factors impact the ability of currently available groundwater remediation technologies to reduce contaminant concentrations below the NYSDEC Groundwater Standards/Criteria:

1. The potential presence of off-site, upgradient sources of contamination, and
2. The fine-grained and heterogeneous nature of on-site soils and the presence of fractured bedrock.

Removal of contaminated soils during the IRM removed over 90% of contaminated soil that acts as an on-site source of contaminants to groundwater; however, off-site sources may remain that could continue to contribute to groundwater contamination. A groundwater remediation system that involves removal or extraction of contaminants may not achieve cleanup if off-site sources remain that could continue to contribute contaminants to groundwater.

Aggressive groundwater remediation is not recommended for this site. Due to the site-specific geology, it is considered impractical given currently available technologies to achieve cleanup to groundwater standards. The recommended groundwater management option is groundwater monitoring. This option will allow an evaluation of the natural degradation of groundwater contaminants with time, which can be used by BP America and the NYSDEC to evaluate the need for any further action at the site.

Monitoring should consist of periodic groundwater sampling for a specific monitoring period of several years to document on-site groundwater conditions as they change with time. At the end of the specified monitoring period, the need for further monitoring should be evaluated.

Monitoring frequency and other details will be provided at a later date in a detailed groundwater monitoring plan.

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1. INTRODUCTION

The former Carborundum Company's Hyde Park facility ("site") in Niagara Falls is listed on the New York State Department of Environmental Conservation's (NYSDEC's) list of Inactive Hazardous Waste Disposal Sites. The site, which is classified as a Class 2 site, is identified as Site No. 932036. A Class 2 site is defined as a site that poses a significant threat to the public health or the environment and one that requires mitigative action.

The Carborundum Company was required by an NYSDEC Order on Consent (INDEX# B9-0454-94-04) to conduct a remedial investigation/feasibility study (RI/FS) of the site. BP America retained the environmental liability associated with the site during the acquisition of the Carborundum Company and subsequent sale of the subject property. Duke Engineering & Services, Inc. (DE&S) was retained by BP America to undertake the RI/FS.

A Remedial Investigation (RI) of the site was completed in 1996 by DE&S, formerly Intera Consultants, Ltd. A Phase II RI was completed in November 1997. Results of the RI and Phase II RI indicate that soils exist in several areas on the property that contain volatile organic compounds (VOCs) and/or polycyclic aromatic hydrocarbons (PAHs) at concentrations that exceed NYSDEC Soil Cleanup Objectives.

A work plan, and plans and specifications for conducting an interim remedial measure (IRM) were submitted and approved by the NYSDEC in 1999. That work program included a drilling and soil sampling investigation to further refine the extent of contaminated soils and the removal of those soils as part of an IRM. A detailed description of the results is presented in the IRM report (DE&S, 1999c). Removal of contaminated soils was executed as a permanent part of the remedial solution for the site. Contaminated soils were excavated and hauled off site for appropriate disposal.

A summary of the results of the RI, Phase II RI, and IRM Investigation is presented in Section 2. A summary of results of the IRM is provided in Section 7. The remainder of this report presents the Feasibility Study (FS) that was undertaken for the site.

1.1 PURPOSE

The purpose of the RI/FS is to develop and implement a cleanup program that will allow the removal of the site from the NYSDEC's list of hazardous waste disposal sites. The FS follows a series of steps that ultimately leads to a Record of Decision and site cleanup. These steps include:

- identification of criteria specific to applicable or relevant and appropriate requirements (ARARS)
- identification of potential treatment technologies/management options
- assessment of technologies/management options
- screening of technologies/management options
- detailed analysis of alternatives
- selection of a remedy

1.2 REPORT ORGANIZATION

The remainder of this section of the report provides background information relating to site history and physical features. Section 2 provides a summary of results of the RI, Phase II RI, and IRM Investigation work that has been completed to date. Section 2 also provides a discussion of the contaminants of concern and provides a description of areas and volumes of contamination on the site, as known following completion of the IRM investigation. Section 3 develops the remedial action objectives for the site and identifies the applicable and relevant or appropriate requirements (ARARS). Section 4 provides a discussion of the identification and preliminary screening of potential remedial technologies/management options. Section 5 describes the criteria that will be used to initially screen out technically infeasible options and provides a screening of alternatives for groundwater. Section 6 describes the recommended alternatives for groundwater. Section 7 provides a summary of the results of the IRM for soil.

1.3 BACKGROUND

The following is a brief chronology of the work that has been completed to date to characterize the environmental condition of the site, and associated references.

- 1985: The Carborundum Company retained Earth Dimensions Inc. of East Aurora, NY to undertake preliminary soil and groundwater sampling at the site.

  Earth Dimensions Inc. (1985) Soils Report Preliminary Site Assessment (PSA) Hyde Park Facility, Carborundum Globar Manufacturing, Niagara Falls, N Y.

- 1990: NYSDEC retained URS Consultants Inc. of Buffalo, NY to complete a records search and preliminary assessment. Field work consisted of a site visit and field measurements of air quality and radioactivity.

  URS Consultants Inc. (1990) Engineering Investigations at Inactive Hazardous Waste Sites, Preliminary Site Assessment, Carborundum Company Globar Plant Site No. 932036 Niagara (T), Niagara (C), Prepared for: NYSDEC Division of Hazardous Waste Remediation.

- 1992: The Carborundum Company retained DE&S, formerly INTERA, to complete soil sampling, groundwater sampling and to provide a preliminary assessment of risk to human health and the environment.

  INTERA (1993) Report on the Preliminary Site Assessment of the Carborundum Company - Electric Products Division, Hyde Park Facility, Town of Niagara, Niagara County, NY. Prepared for The Carborundum Company Site No. 932036.

- 1993: The Carborundum Company retained DE&S, formerly INTERA, to undertake additional borehole drilling and soil sampling. No report was prepared.

- 1996: BP America retained DE&S, formerly INTERA, to conduct a RI. This work involved additional soil and groundwater sampling both on and off site to better define the extent of contamination. A more comprehensive risk assessment was undertaken.

  INTERA (1997) Remedial Investigation of the Former Carborundum Company Electric Products Division, Hyde Park Facility, Town of Niagara, Niagara County, NY. Site No. 932036.

- 1997: BP America retained DE&S to conduct a Phase II RI that included installing a groundwater monitor well to bedrock downgradient of the site, conducting additional soil sampling, and conducting a round of groundwater sampling from all wells.

DE&S (1998) Phase II Remedial Investigation of the Former Carborundum Company Electric Products Division, Hyde Park Facility, Town of Niagara, Niagara County, NY. Site No. 932036.

- 1998. BP America retained DE&S to prepare an IRM work plan and plans and specifications document for execution of the IRM at the site.

  DE&S (1999) Interim Remedial Measure Work Plan for the Former Carborundum Company Electric Products Division, Hyde Park Facility, Town of Niagara, Niagara County, NY. Site No. 932036.

  DE&S (1999) Plans and Specifications for Execution of the Interim Remedial Measure for the Former Carborundum Company Electric Products Division, Hyde Park Facility, Town of Niagara, Niagara County, NY. Site No. 932036.

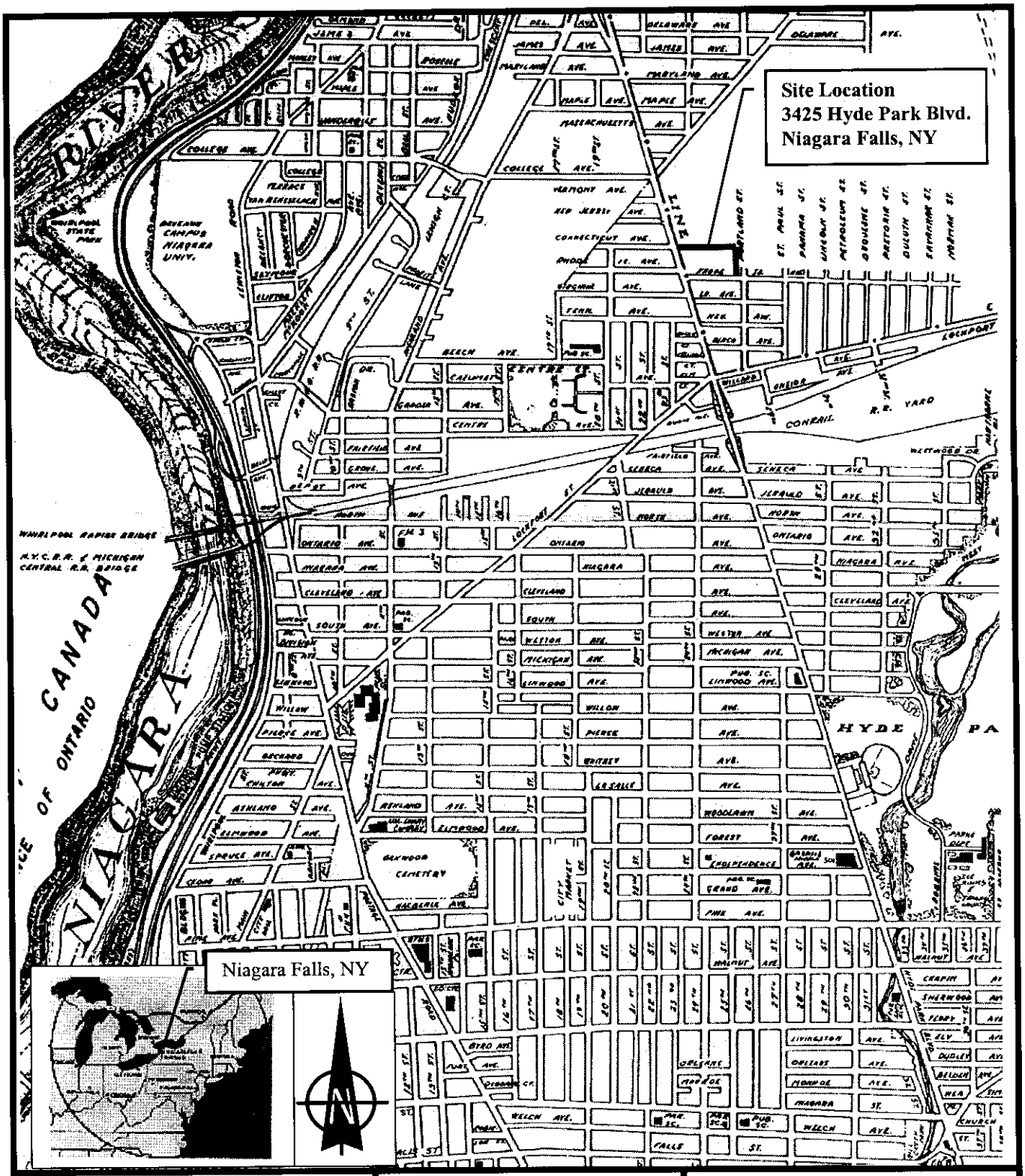
- 1999. BP America retained DE&S to oversee execution of the IRM at the site.

  DE&S(1999) Execution of the Interim Remedial Measure for the Former Carborundum Company Electric Products Division, Hyde Park Facility, Town of Niagara, Niagara County, NY. Site No. 932036.

1.3.1 Site Description and Brief History

The Carborundum Company's former Electric Products Division facility is bordered on the west side by Hyde Park Boulevard and on the south side by Rhode Island Avenue in the Town of Niagara in Niagara County, New York. A location map showing the site is provided on Figure 1.1. The plant manufactured heating elements and electronic components from silicon carbide and was purchased by The Carborundum Company from the Globar Company in 1936. The Carborundum Company was purchased by BP America and the facility was subsequently sold to CESIWID, Inc. in December 1993. CESIWID changed its corporate name to Kanthal-Globar in 1998 and continues to manufacture similar products.

A site plan is provided as Figure 1.2. The west half of the site is occupied by the plant buildings. The east half of the site consists of a paved parking lot and a gravel area that was formerly used for staging and storing excess materials (sand, silicon carbide, scrap graphite and steel, and empty drums). Prior to 1962, the gravel area was also used to burn cardboard, paper and scrap wood (INTERA, 1993). This area, which is less than one acre in size in the northeastern portion of the former Carborundum Company facility property, has been designated by NYSDEC as a Class 2 inactive hazardous waste disposal site.



Duke Engineering & Services (Canada), Inc. *A Duke Energy Company*	**Figure 1.1**	**Site Location Map**

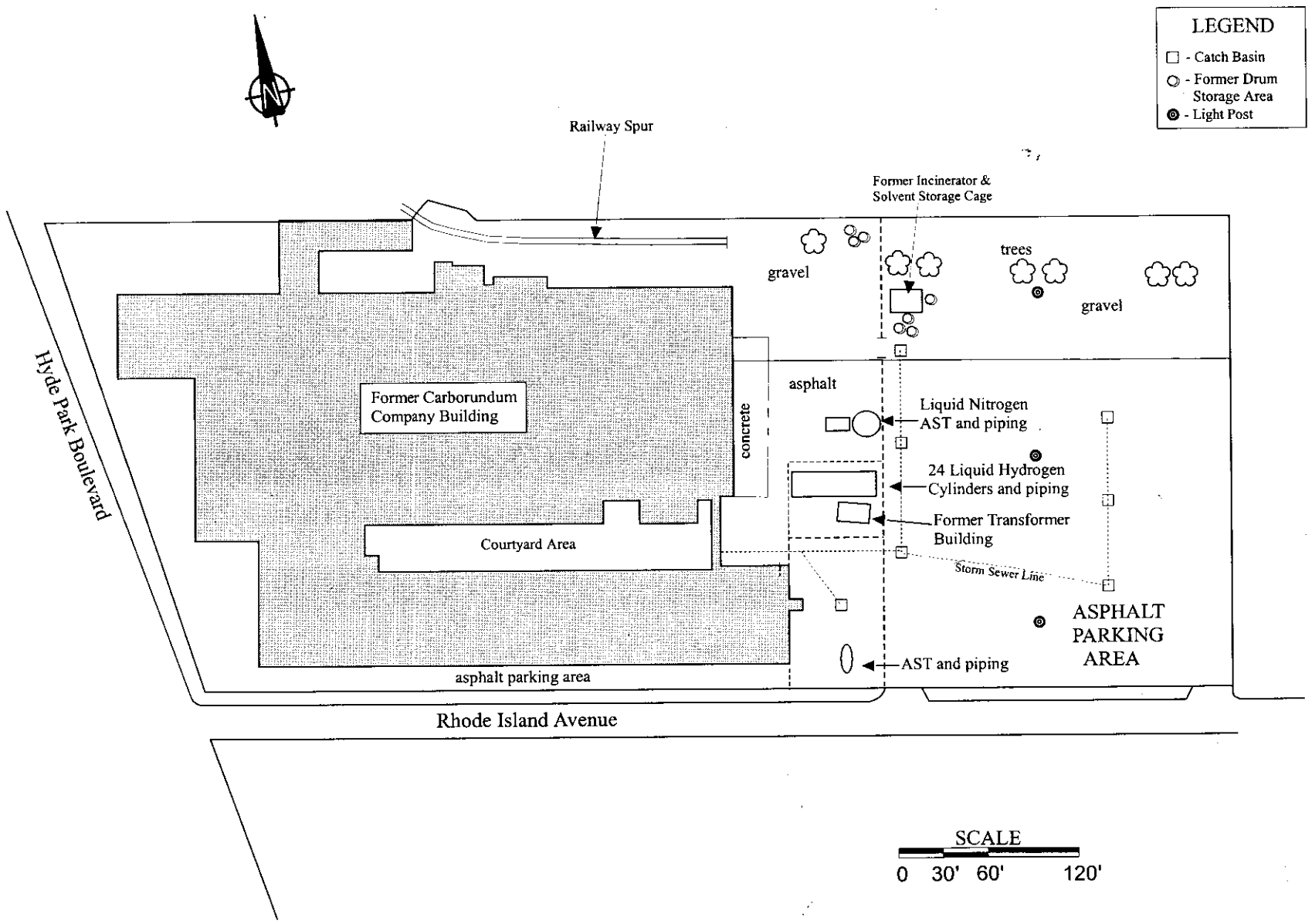


Figure 1.2	Job #: 94-085	Site Plan	Duke Engineering & Services (Canada), Inc. A Duke Energy Company
Date: Nov. 25, 1998	Drawn/File Name: VP/Fig1_2.cdr	Former Carborundum Company - Electric Products Division	3075 14 Avenue, Suite 207 Markham, Ontario Canada L3R 0G9 (905) 513-9400 fax (905) 513-9405

The area immediately to the north and west of the Carborundum Company facility is occupied by light and heavy industry while the area immediately to the east and south is residential. Figure 1.3 shows the locations of past and present industrial sites upgradient of the site and approximate groundwater flow directions. Groundwater flow in this area is affected by Power Authority of the State of New York (PASNY) conduits that are located approximately 5,200 feet east of the former Carborundum Company site (INTERA, 1997). The conduits influence groundwater flow, creating a groundwater divide to the east of the site. East of the divide, groundwater flow is directed toward the buried conduits. West of the divide, groundwater flows southwest toward the Niagara River. The Vanadium Corporation of America (formerly SKW Alloys) Landfill and the Occidental Chemical Hyde Park Landfill are listed by the United States Environmental Protection Agency (USEPA) as Priority Niagara River Hazardous Waste Sites.

The Vanadium Corporation of America owns a 62 acre landfill less than 1200 feet upgradient of the former Carborundum Company site. The landfill has not been active for several years. Groundwater sampling results for individual organic constituents were not available during the preliminary site assessment (PSA) completed by INTERA Inc. in 1992; however, total organic carbon levels in groundwater beneath the Vanadium landfill are relatively high (INTERA 1993). The Union Carbide site is also located immediately north and east of the former Carborundum Company site. The Union Carbide site includes a closed landfill where hazardous wastes are suspected to have been disposed (INTERA 1993). Suspected wastes include coal tar, petroleum tars, machine oils and spent degreasing sludges. On the upgradient side of the Union Carbide landfill, the groundwater in the bedrock aquifer was found to contain elevated levels of trichloroethene, 1,1,2,2-tetrachloroethene, vinyl chloride, chloroform and hexachlorobutadiene (INTERA 1993). Although concentrations of some of these compounds are lower than those detected on the former Carborundum Company site, the presence of two USEPA hazardous waste sites and other industrial sites upgradient of the former Carborundum Company property indicates that groundwater contamination on the former Carborundum Company site may be at least partially due to offsite or upgradient sources. Additional data must be collected to better determine the potential impact of upgradient sites on the former Carborundum Company property.

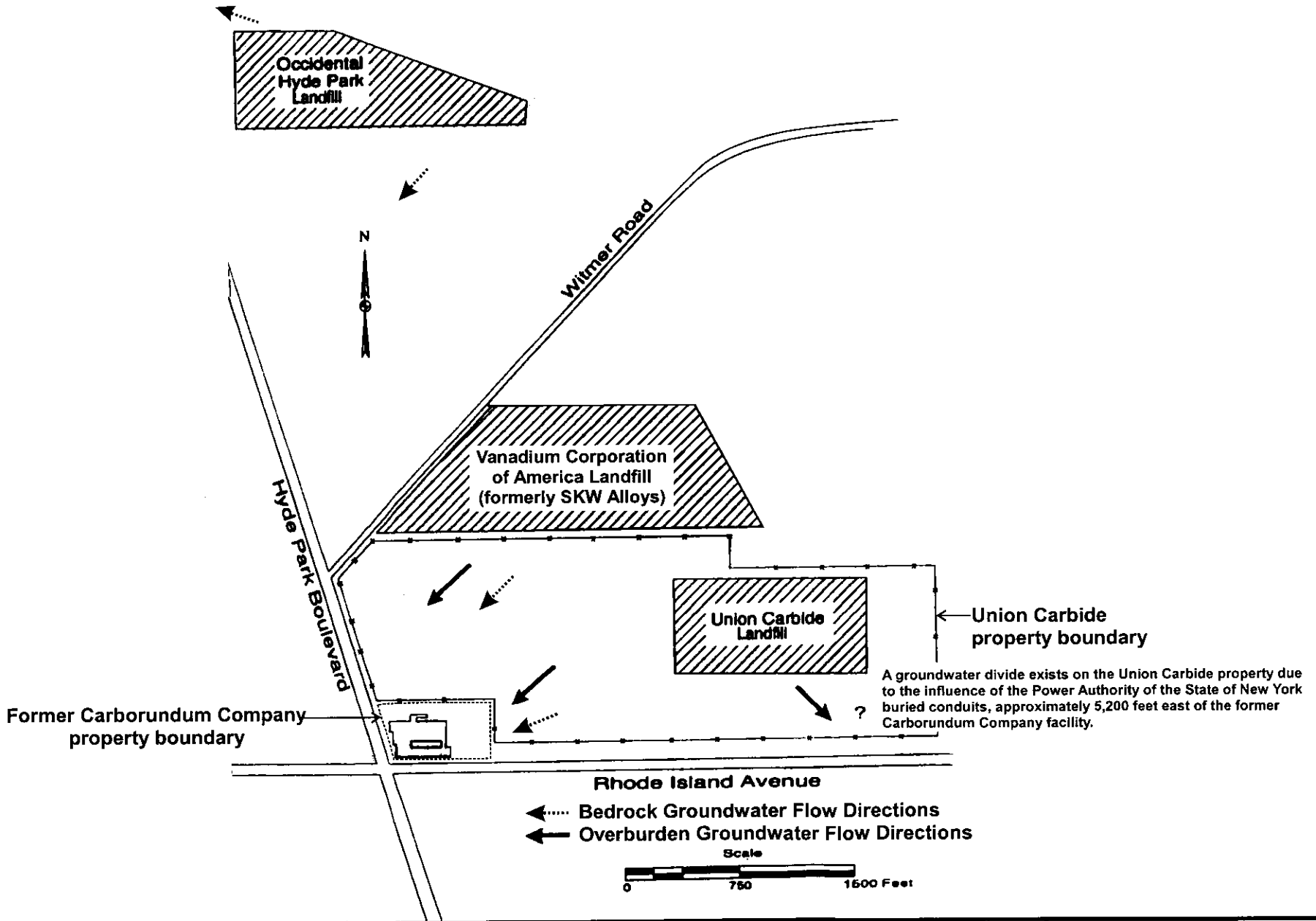


Figure 1.3	Job #: 94-085	Map of Industrial Sites Upgradient of Subject Property	Duke Engineering & Services (Canada), Inc. A Duke Energy Company
Date: March 16, 1999	Drawn/File Name: VLP/Fig1_3.cdr		3075 14th Avenue, Suite 207 Markham, Ontario Canada L3R 0G9 (905) 513-9400 fax (905) 513-9405

1.3.2 Site Topography and Hydrogeology

The topography at the site is flat with a gentle slope across the property to the south. Elevation at the site is approximately 595 feet above mean sea level. The land immediately north of the former Carborundum Company site is several feet higher in elevation and is occupied by an industrial park. This area was formerly owned and occupied by Union Carbide Corporation.

General geology in the area consists of glaciolacustrine sediments and glacial till 17-32 feet in thickness overlying Middle Silurian dolostone bedrock of the Lockport Dolomite. The glacial till layer consists of fractured, very dense, fine-grained, heterogeneous, reddish-brown, silty-clay till.

The water table in the vicinity of the site occurs at depths ranging from 2.3 to 12.2 feet below ground surface (INTERA 1993, 1997 and DE&S, 1998) with perched conditions reported at the northeast edge of the site. The major aquifer in the area is the weathered, fractured, upper portion of bedrock that occurs between 16.5 and 32 feet below ground surface (DE&S 1997). Groundwater flow directions are generally southwesterly across the site for groundwater in both shallow overburden and deeper bedrock. Annual groundwater flow velocities range from 3-10 feet per year in overburden to 100-200 feet per year in bedrock (INTERA 1993, 1997 and DE&S, 1998).

2. SUMMARY OF INVESTIGATION RESULTS

2.1 CONTAMINANTS OF CONCERN

Contaminants of concern (COCs) in soils at the site were identified as volatile organic compounds (VOCs) and polycyclic aromatic hydrocarbons (PAHs).

2.1.1 Volatile Organic Compounds

VOCs have been identified in both soil and groundwater on site. Specific VOCs identified in soils include:

1,2-dichloroethene	trichloroethene
vinyl chloride	toluene
acetone	ethyl benzene
xylenes	

In groundwater, the following VOCs have been detected at concentrations in excess of NYSDEC Groundwater Quality Standards or Guidance Values:

vinyl chloride	trichloroethene
1,2-dichloroethene	benzene
1,1-dichloroethane	

Acetone, trichloroethene, and xylenes were used in operations at the Carborundum Electric Products Division facility. Vinyl chloride, 1,2-dichloroethene and 1,1-dichloroethane are breakdown products of trichloroethene. Benzene, toluene, ethyl benzene, and xylenes are components of petroleum products, and may indicate historic spillage or leakage of petroleum products on the property.

Trichloroethene in groundwater naturally breaks down with time to form 1,2-dichloroethene, which degrades to form vinyl chloride, which in turn degrades to carbon dioxide and water.

2.1.2 Polycyclic Aromatic Hydrocarbons

Specific PAHs identified on site include:

naphthalene	acenaphthylene
fluorene	phenanthrene
anthracene	pyrene
benzo(a)anthracene	chrysene
benzo(b)fluoranthene	benzo(k)fluoranthene
benzo(a)pyrene	indeno(1,2,3cd)pyrene

These compounds are components of coal tar, creosote and oil and grease. PAHs are restricted to soils in the vicinity of the north property fence and railroad spur and are associated with a former oil spill on the adjacent property to the north.

2.2 EXTENT OF SOIL CONTAMINATION

Extensive soil sampling has been conducted in shallow, mid-level, and deeper soils at the site (INTERA 1993, 1997 and DE&S, 1998, 1999b). Appendix A includes a figure depicting sample locations and a summary table of soil sampling results for COCs.

COCs were found in five areas on the site at concentrations in excess of NYSDEC Soil Cleanup Objectives:

Area 1	A small area in the vicinity of the north property fence and railway spur contaminated with VOCs and PAHs,
Area 2	A larger area within the former scrap metals storage area contaminated with VOCs,
Area 3	A small area south of Area 1 contaminated with VOCs,
Area 4	A small area in the southeastern portion of the site contaminated with acetone, and
Area 5	A small area in the southwestern portion of the site contaminated with xylenes and lead.

Figure 2.1 depicts the extents of contamination, as identified during the IRM excavation activities. Soil contamination was found primarily at shallow depths. A brief description of soil contamination in each area follows.

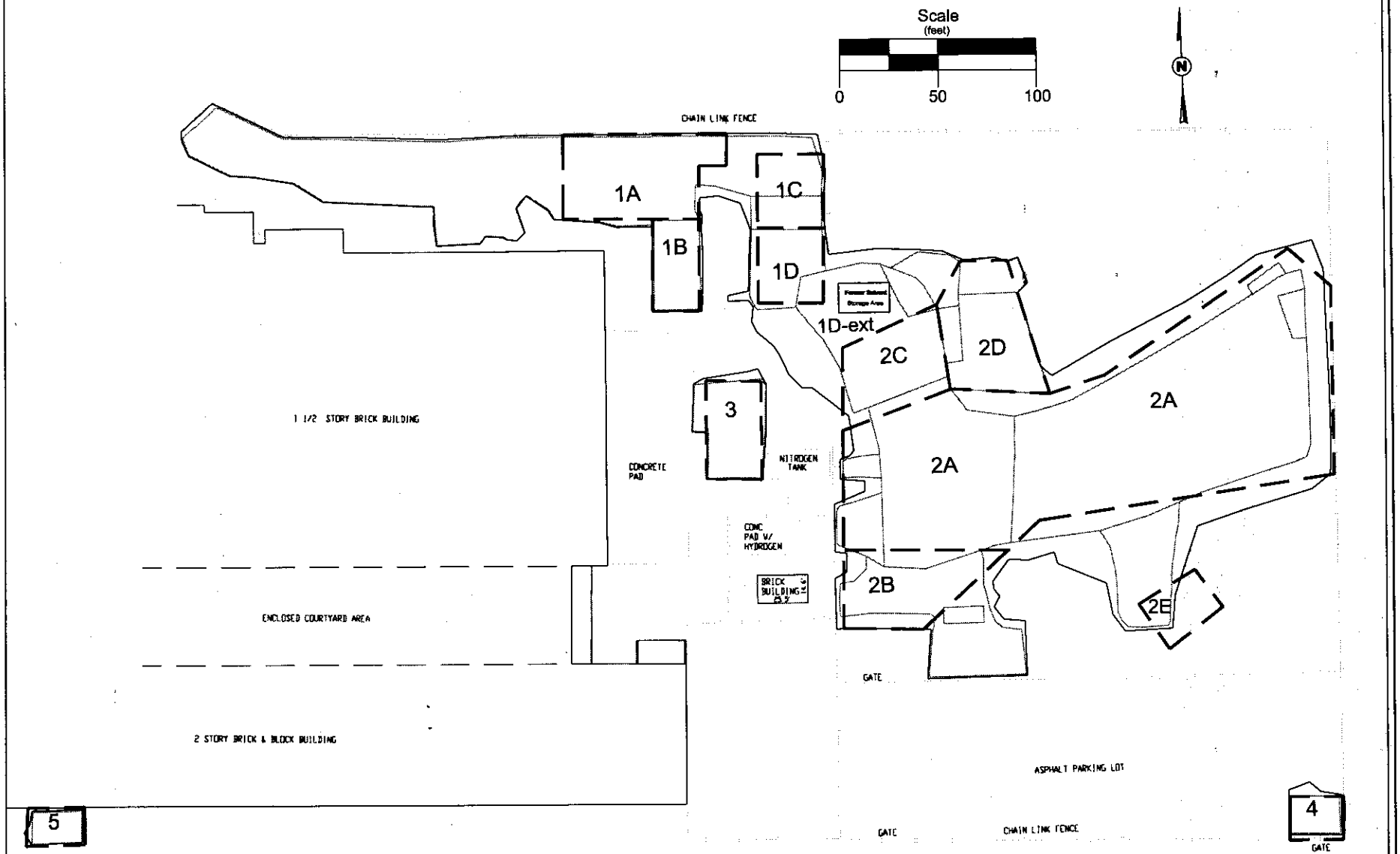


Figure #:	Areas of Soil Contamination		
2.1			
Project #: TM8097	Date: August 18, 1999	Drawn by: MSM	File Name: Fig2_1_FS99.dwg

Legend

- Estimated excavation extent
- Top of bank - actual excavation
- Bottom of bank - actual excavation extent

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2.2.1 Area 1

Area 1 was located in the railroad spur area in the northern portion of the site and contained soils contaminated with PAHs and VOCs. Area 1 contained four contaminated sub-areas. The first (1A) was located in the western portion of Area 1 and was impacted to a depth of up to 4 ft with VOCs and PAHs. Excavation in this area was extended west along the railroad spur to remove PAHs identified in surficial soils. The second area (1B) was located south of 1A and was impacted with VOCs between 8 to 10 ft in depth. Area 1C was located in the northeastern portion of Area 1 and was impacted by VOCs to 6 ft depth. Areas 1A and 1C were extended during excavation beyond their identified boundaries and eventually merged. Finally, Area 1D was located adjacent to the former solvent storage cage to the west. During the IRM, the solvent storage cage was removed and Area 1D was extended to the east to remove VOC contamination identified beneath the former solvent storage area (Area 1D extension). Area 1D extension eventually merged with Area 2C.

2.2.2 Area 2

Area 2 was located in the center of the parking area in the eastern portion of the site and was contaminated with VOCs, consisting of primarily trichloroethene and its breakdown products. Area 2 contained five contaminated sub-areas. The first, 2A, was the largest and extended from the eastern fence line to the western fence for the parking area to a depth of up to 24 ft. The second area, 2B, was small and located immediately south of the larger area to a depth of 16 ft. Area 2C was located immediately south of the former solvent storage cage and was impacted with VOCs to 24 ft depth. Area 2D was located to the east of the former solvent storage area and was impacted with VOCs to 7 ft depth. The fifth area, 2E, was impacted with VOCs to 12 ft and was located south of area 2A. Areas 2A and 2E were merged during excavation.

2.2.3 Area 3

Area 3 was located between the liquid nitrogen above ground storage tank (AST) and the concrete pad for the building and was impacted to a depth of 4 feet. Trichloroethene, cis- and trans-1,2-dichloroethene, acetone and total xylenes were detected at concentrations that exceed NYSDEC Soil Cleanup Objectives.

2.2.4 Area 4

Area 4 was located in the southeast corner of the site in the gateway used as an exit from the plant parking lot and was impacted to a depth of 4 feet. Acetone was detected at a concentration that exceeds the NYSDEC Soil Cleanup Objective.

2.2.5 Area 5

Area 5 was located in the southwest corner of the site in the executive parking area and was impacted to a depth of 2 feet with xylenes and lead. Total xylenes were detected at a concentration that exceeded the NYSDEC Soil Cleanup Objective. Lead was detected at a concentration that exceeded maximum toxicity characteristic concentrations in leachate.

2.3 EXTENT OF GROUNDWATER CONTAMINATION

Groundwater samples have been collected from monitoring wells on the site on three separate occasions. In 1992, monitoring well couplets MW-1 through MW-5 were sampled as part of the PSA. In 1996, additional monitoring wells MW-6 through MW-14 were sampled as part of the RI. Finally, in 1997 all 25 existing monitoring wells plus an additional well (MW-15) were sampled as part of the Phase II RI. Appendix B includes a figure depicting monitoring well locations and a summary table of groundwater sampling results for COCs.

2.3.1 Groundwater in Overburden

Results of VOC analysis on groundwater samples collected from the shallow, overburden wells on-site indicate that vinyl chloride, 1,2-dichloroethene, trichloroethene, benzene and 1,1-

dichloroethane exist in groundwater in the overburden at concentrations that exceed NYSDEC Water Quality Standards/Regulations. VOC concentrations in overburden wells are highest along the northern property boundary in the railroad spur area in MW-7A, which is considered an upgradient well. However, the highest vinyl chloride concentration was detected in MW-10A, located along the south property boundary directly downgradient of MW-7A. VOCs were not detected in overburden wells MW-1A, MW-3A, MW-11A, MW-13A, and MW-14A. MW-1A and MW-11A are located on the southeastern and southwestern property boundaries, respectively. MW-13A and MW-14A are located down gradient of the site across Rhode Island Avenue. MW-3A is located in the northeastern corner of the site. The most commonly detected compounds in groundwater in the overburden were 1,2-dichloroethene, trichloroethene and vinyl chloride. Figure 2.2 provides total VOC concentration results from 1997 sampling and total VOC concentration contours on a site map. The shape of the contours indicates that a source for VOC contamination may be off-site to the north.

Table 2.1 provides a summary of average contaminant concentrations detected in monitoring wells during the PSA/RI sampling round conducted in 1992/1996 and the Phase II RI sampling round conducted in 1997. From this data, it is clear that the maximum and average concentrations of vinyl chloride, trichloroethene, and benzene have decreased with time. The average concentrations of vinyl chloride, trichloroethene and benzene have decreased by 90%, 87%, and 97%, respectively. Average concentrations of 1,2-dichloroethene and 1,1-dichloroethane have increased with time by 44% and 263%, respectively. The increase in 1,2-dichloroethene and 1,1-dichloroethane concentrations, both breakdown products of trichloroethene, provides further evidence of the ongoing natural breakdown of trichloroethene on the site.

Figure 2.3 presents the total VOCs concentrations in the overburden monitoring wells in bar chart format. Total VOCs concentrations in 1997 are lower than in previous monitoring in 1992 and 1996 in all wells except MW-10A.

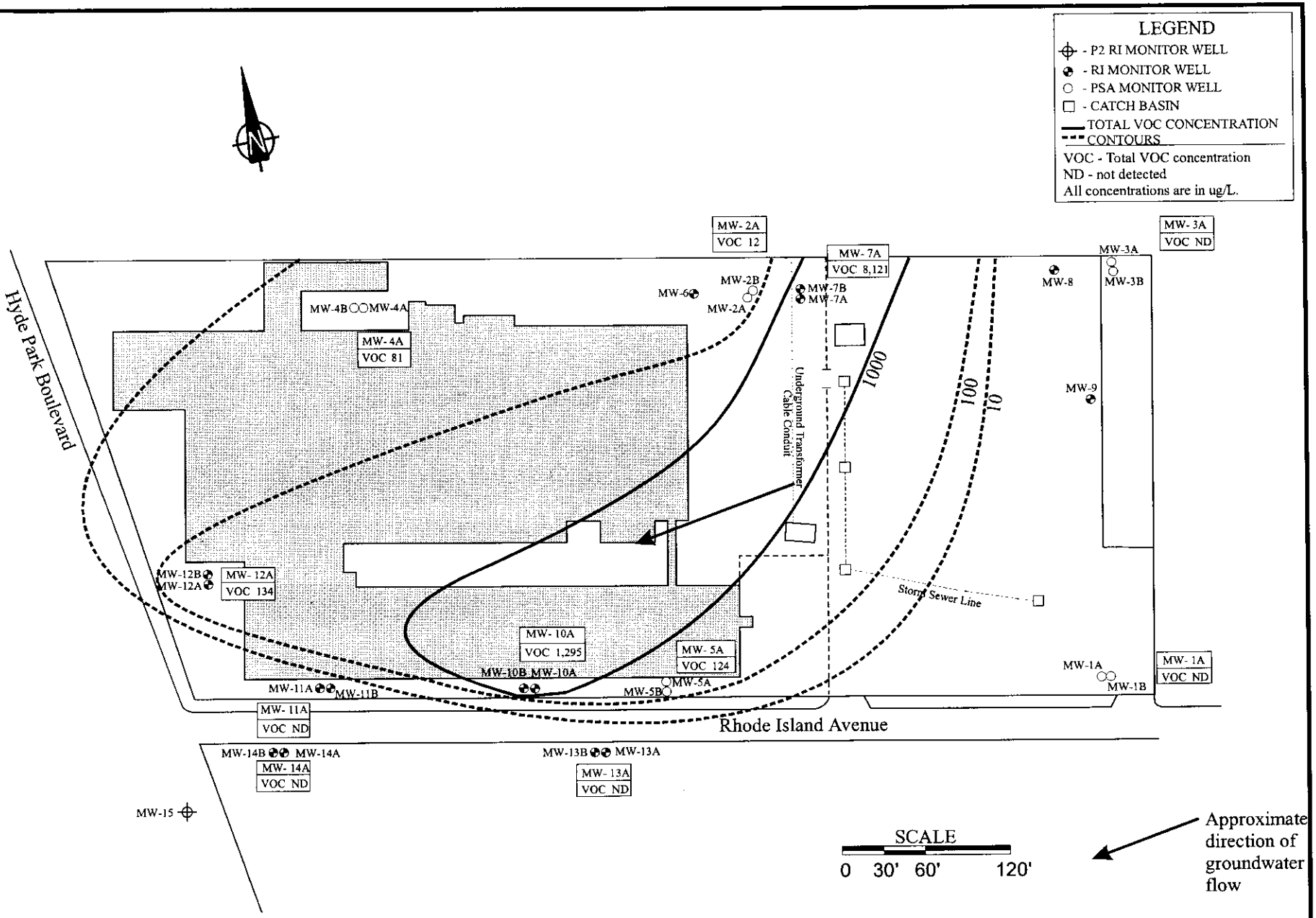


Figure 2.2	Job #: 94-085	Total VOC Groundwater Analytical Results - Shallow Wells - Nov. 1997	Duke Engineering & Services (Canada), Inc. A Duke Energy Company
Date: March 19, 1999	Drawn/File Name: VLP/Fig2_2.cdr	Former Carborundum Company - Electric Products Division	3075 14th Avenue, Suite 207 Markham, Ontario Canada L3R 0G9 (905) 513-9400 fax (905) 513-9405

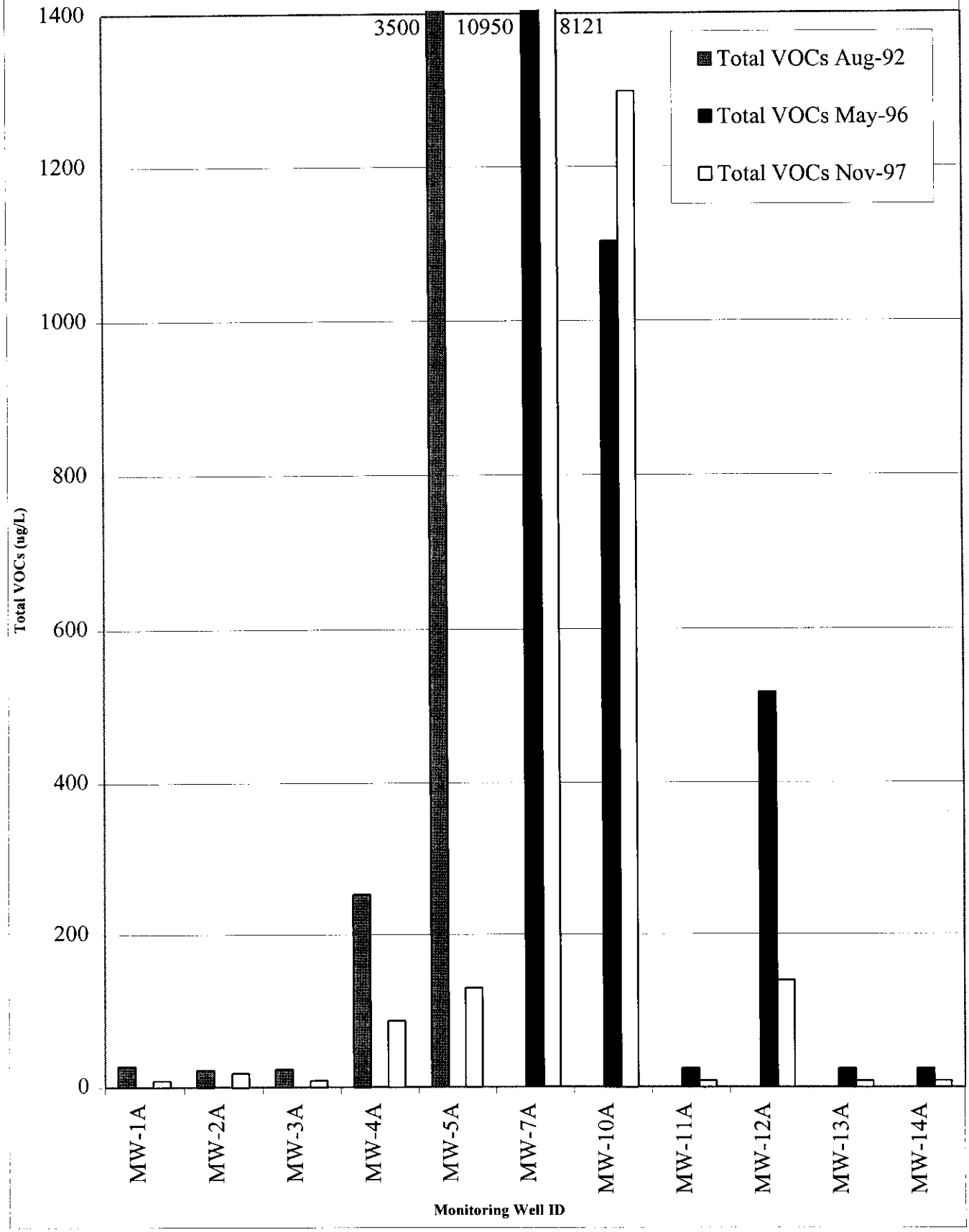
TABLE 2.1 CHANGE IN CONTAMINANT CONCENTRATION IN OVERBURDEN MONITORING WELLS WITH TIME.

Contaminant	1992			1996			1997						Average % Change[1]
	Average [C] in wells MW1A-5A	Minimum [C]	Maximum [C]	Average [C] in wells MW7A-14A	Minimum [C]	Maximum [C]	Average [C] in wells MW1A-5A	Minimum [C]	Maximum [C]	Average [C] in wells MW7A-14A	Minimum [C]	Maximum [C]	
	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	
Vinyl Chloride	265	<10	1,300	94	<10	500	10	<2	32	16	<2	65	-90
Cis- and trans— 1,2-dichloroethene	431	<10	1,900	389	<10	1,200	33	<5	110	1,091	<5	5,206	44
Trichloroethene	23	<10	100	1,475	<10	8,700	3	<5	2.5	235	<5	1,400	-87
Benzene	24	<10	100	111	<10	500	1	<0.7	2.5	1	<0.7	4	-97
1,1-dichloroethane	22	<10	100	36	<10	125	4	<0.7	12	255	<5	1,500	263

[C] - Concentration

[1] – Average % change is the change in average contaminant concentration between the first round of sampling in 1992 or 1996 and the most recent sampling round in 1997.

Figure 2.3 Total VOC Concentrations in Overburden Monitoring Wells



2.3.2 Groundwater in Bedrock

Results of VOC analysis on groundwater samples collected from the deeper, bedrock wells on-site indicate that vinyl chloride, 1,2-dichloroethene, trichloroethene, benzene and 1,1-dichloroethane exist in groundwater in the bedrock at concentrations that exceed NYSDEC Water Quality Standards/Regulations. VOC concentrations in bedrock wells are highest along the south property boundary in MW-10B, MW-11B, MW-14B and MW-15. VOCs were not detected in bedrock wells MW-1B and MW-3B. MW-1B is located in the southeastern corner of the site, while MW-3B is located in the northeastern corner of the site. The most commonly detected compounds in groundwater in the bedrock were 1,2-dichloroethene, trichloroethene and vinyl chloride. Figure 2.4 provides total VOC concentrations from 1997 sampling and total VOC concentration contours on a site map. The shape of the contours indicates that a source for VOC contamination may be off-site to the north of the former Carborundum Company property.

Table 2.2 provides a summary of average contaminant concentrations detected in monitoring wells during the PSA/RI sampling round conducted in 1992/1996 and the Phase II RI sampling round conducted in 1997. From this data, a general trend of decreasing VOC concentrations can be seen. The maximum and average concentrations of all VOCs have decreased with time by 4% to 88%.

Figure 2.5 presents the total VOC concentrations in the bedrock monitoring wells in bar chart format. Total VOC concentrations in 1997 are lower than in previous monitoring in 1992 or 1996 in all wells except MW-11B, MW-12B and MW-14B.

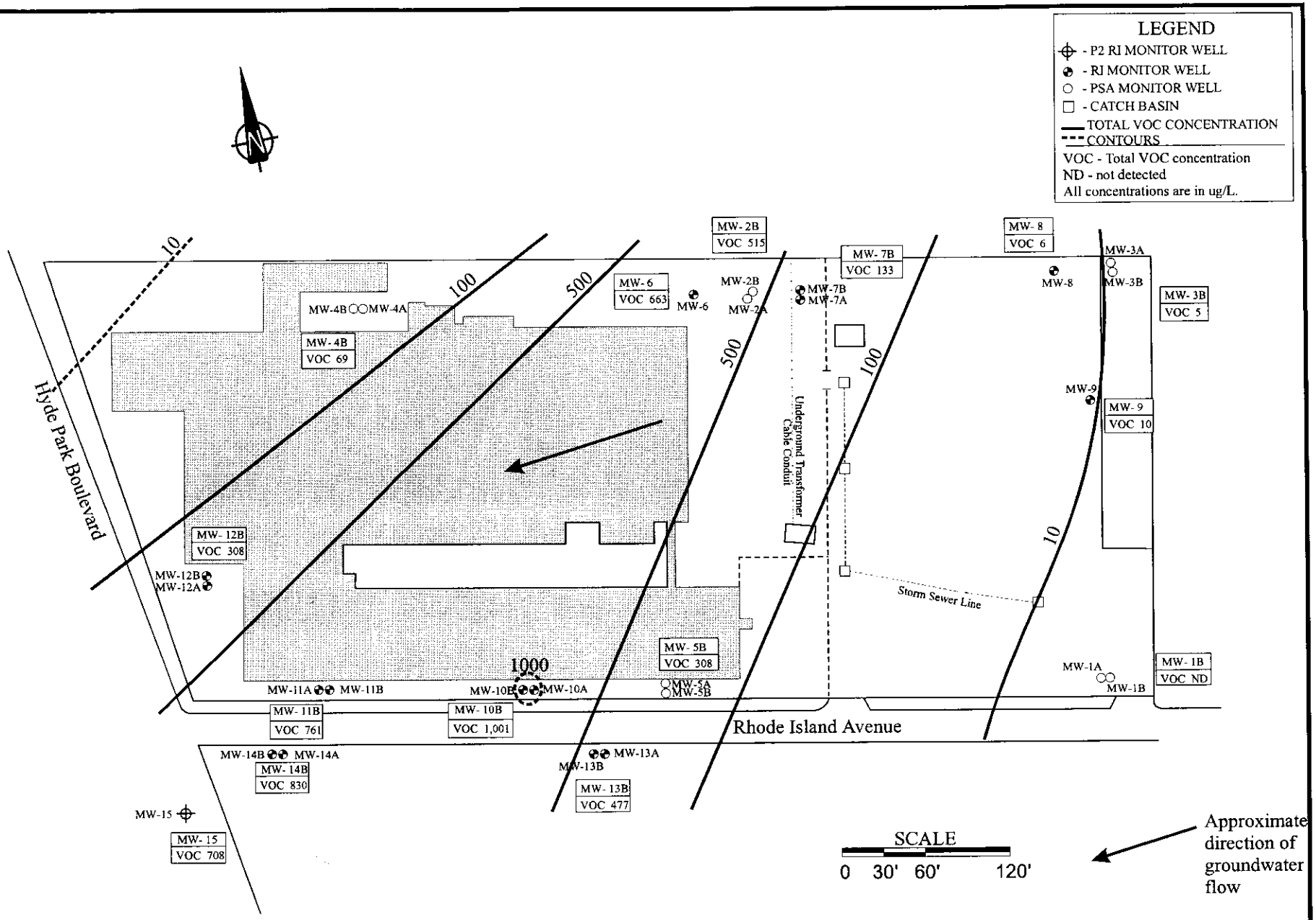


Figure 2.4	Job #: 94-085	Total VOC Groundwater Analytical Results - Deep Wells - Nov. 1997
Date: March 19, 1999	Drawn/File Name: VLP/Fig2_4.cdr	Former Carborundum Company - Electric Products Division

Duke Engineering & Services (Canada), Inc.
A Duke Energy Company
3075 14th Avenue, Suite 207
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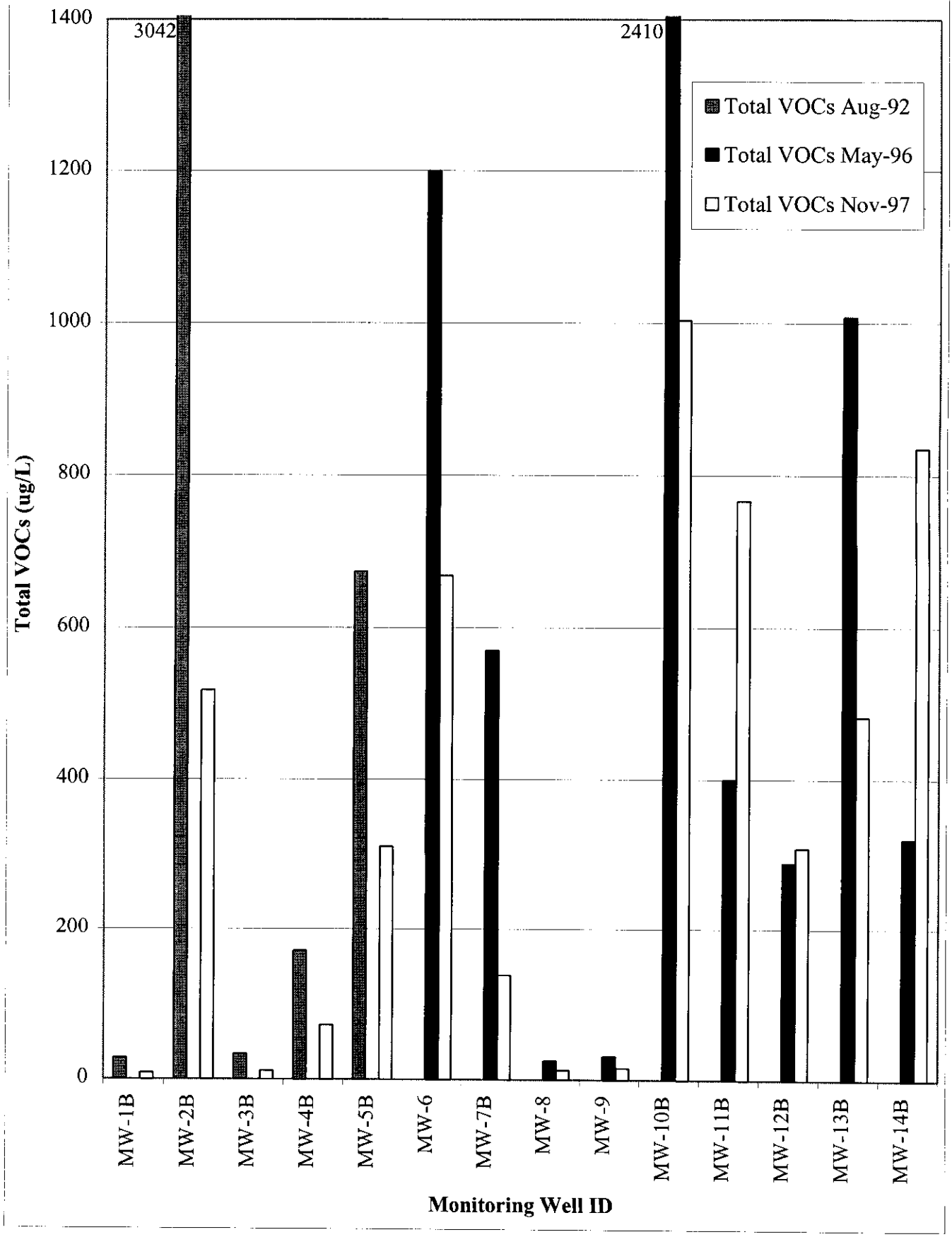
TABLE 2.2 CHANGE IN CONTAMINANT CONCENTRATION IN BEDROCK MONITORING WELLS WITH TIME.

Contaminant	1992			1996			1997						Average % Change[1]
	Average [C] in wells MW1B-5B	Minimum [C]	Maximum [C]	Average [C] in wells MW6-15	Minimum [C]	Maximum [C]	Average [C] in wells MW1B-5B	Minimum [C]	Maximum [C]	Average [C] in wells MW6-15	Minimum [C]	Maximum [C]	
	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	
Vinyl Chloride	35	<10	75	33	<10	120	23	<2	59	42	<2	68	-4
Cis- and trans—1,2-dichloroethene	596	<10	2,300	561	<10	1,900	155	<5	450	441	6	921	-48
Trichloroethene	151	<10	670	30	<10	90	4	<5	6	9	<5	36	-84
Benzene	3	<10	5	35	<10	150	1	<0.7	2.5	0.4	<0.7	0.5	-88
1,1-dichloroethane	4	<10	5	35	<10	150	2	<0.7	2.5	3	<5	5	-72

[C] - Concentration

[1] – Average % change is the change in average contaminant concentration between the first round of sampling in 1992 or 1996 and the most recent sampling round in 1997.

Figure 2.5 Total VOC Concentrations in Bedrock Monitoring Wells



2.4 RISK ASSESSMENT

The Risk Assessment conducted during the RI (INTERA, 1997) concluded that contaminant levels do not pose an immediate threat to human health or the environment. The Fish and Wildlife Impact Assessment concluded that the availability of natural resources that would support fish and wildlife in the subject area is severely limited by historical industrial and residential development. The site itself does not contain wildlife resources, and therefore does not have potential for wildlife exposure. The limited natural vegetation adjacent to the site has also been restricted by industrial development. Therefore, the site does not have a significant impact on fish or wildlife.

Potential receptors for the COCs at the facility include workers at the Kanthal-Globar plant and individuals living in the residential area immediately south and downgradient of the facility. Exposure pathways include the inhalation or dermal contact of soil containing COCs by plant or maintenance workers, and inhalation of COCs inside the plant and in downgradient residential homes from contaminants that have volatilized from groundwater.

The determination of risk resulting from exposure to contaminants is expressed in terms of a Hazard Index (HI) for non-carcinogenic contaminants and the level of risk for carcinogenic contaminants. The characterization of risk has been determined for the uncontrolled release of volatile COCs from groundwater flowing beneath the plant and downgradient residential homes. Non-carcinogenic chemicals were considered to be 1,2-dichloroethene, 1,1-dichloroethane, toluene, ethylbenzene, xylenes and acetone. Carcinogenic chemicals were considered to be vinyl chloride and trichloroethene.

The Hazard Index for non-carcinogens for plant workers is estimated to be 0.640 and for residential dwellers is estimated to be 0.017. A Hazard Index greater than 1.0 indicates a potential concern for health effects (USEPA, 1989). Values of 0.64 and 0.017 are well below 1.0, and indicate that there is little potential negative health effect from exposure to volatile vapors or contaminated groundwater on the site.

The cancer risk for plant workers exposed to vinyl chloride is estimated to be 9.78×10^{-7} and the risk for exposure to trichloroethene is estimated to be 9.78×10^{-8}, for a total carcinogenic risk of 1.08×10^{-6}. The cancer risks for downgradient residential dwellers due to exposure to vinyl chloride and trichloroethene are estimated to be 6×10^{-8} and 8.94×10^{-10}, respectively for a total carcinogenic risk of 6×10^{-8}. Acceptable cancer risk ranges from 1×10^{-5} to 1×10^{-6} or less (USEPA, 1989). The cancer risk for plant workers falls at the low end of this acceptable range and the risk to residential dwellers falls well below the acceptable range, indicating that there is little potential increased cancer risk from potential exposure to volatile vapors or contaminated groundwater on the site.

A further investigation of potential risks to nearby residential dwellers was conducted during a Phase II RI (DE&S 1998) surface soil sampling program. The purpose of the surface soil sampling was to provide additional information that would allow a preliminary assessment of the potential exposure and risk to residential property owners in the vicinity of the plant from the inhalation of ambient air, direct contact with soils, incidental ingestion of airborne dust or particulates, and ingestion of homegrown fruits and vegetables. The four surface soil samples that were selected by the New York State Department of Health (NYSDOH) were taken from the ground surface to a depth of two inches along the eastern property boundary of the site. VOCs were not detected in any of the four samples. Because the surficial soils did not contain detectable concentrations of COCs, there is no measurable exposure to residential property owners in the vicinity of the plant through inhalation of ambient outdoor air, direct contact with soils, incidental ingestion of airborne dust or particulates, or ingestion of homegrown fruits and vegetables.

The risk assessment concluded that there is little potential for exposure of plant workers or residential dwellers to contaminated soil in the subsurface. However, during excavation of contaminated subsurface soil, appropriate precautions were taken to ensure that workers and the surrounding communities were not exposed to contaminants through either dermal contact or inhalation. Such precautions included air quality monitoring, and the use of rubberized protective clothing and cartridge type respirators by excavation workers, when appropriate.

3. ARARS AND REMEDIAL ACTION OBJECTIVES

3.1 APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARS)

ARARS are federal, state, or local regulations that may apply to the remedial activities at the site. The National Contingency Plan (NCP, March 1990) states that a remedial action must meet all ARARS unless a waiver can be granted. The seven conditions [Superfund Amendments and Reauthorization Act, 1986, Section 121; Comprehensive Environmental Response, Compensation, and Liability Act, 1980, Sections 121(d)(2) and (d)(4)] for a possible waiver of ARARS follow:

1. The remedy under construction is only an interim remedy and is not the final or permanent remedy selected for the site.
2. Compliance with such standards would create a greater risk to public health than the benefit that it would provide.
3. Compliance with such standards is "technically impractical."
4. A different remedy exists that provides public health protection "equivalent" to the preferred cleanup standard.
5. A more stringent state standard, that would otherwise be applicable, has not been consistently applied to other sites in the state.
6. Compliance with an applicable state requirement would effectively result in the statewide prohibition of land disposal of hazardous substances.
7. The cost of the remedy is too expensive, considering the other demands on the fund.

3.1.1 ARARS for Soil

An Interim Remedial Measure (IRM) has been completed at the site. The IRM focused on removal of contaminated soils from the site. The IRM procedures and results are documented in an IRM report (DE&S, 1999c). Soil criteria used during the IRM are briefly discussed below.

3.1.1.1 RCRA Requirements

The Resource Conservation and Recovery Act (RCRA) requirements are applicable to the site if the contaminants of concern are classified as hazardous wastes under RCRA, as described in 40 CFR 261. There are two basic classifications of RCRA hazardous wastes:

1. Characteristic Hazardous wastes

    - Hazardous due to ignitability (D001 waste)
    - Hazardous due to corrosivity (D002 waste)
    - Hazardous due to reactivity (D003 waste)
    - Hazardous due to toxicity (D004 – D043 wastes) as a result of the presence of specific chemical compounds in the TCLP extract solution.

2. Listed Hazardous waste

    - Hazardous waste from non-specific sources (F – series wastes)
    - Hazardous waste from specific sources (K – series wastes)
    - Commercial chemical products (P and U – series wastes)

Wastes are determined characteristic hazardous wastes based on the results of TCLP testing. To determine the applicability of listed waste classifications, it is necessary to understand site history and the contaminant source. According to previous investigations and historical research, the contaminants of concern at the site were released to the environment through waste management practices not regulated in the past, and unintentional spills and leaks. These activities include:

- Storing and washing of empty drums containing chlorinated solvents in the northeastern part of the site,
- An oil spill on the adjacent property to the north, resulting in the deposition of PAHs near the railroad spur,
- Undocumented minor spills of VOCs.

Based on these types of releases, wastes at the Former Carborundum Company facility have been considered U listed wastes, specifically U228 for trichloroethylene, and D listed wastes, specifically D040 for trichloroethylene.

3.1.1.2 NYSDEC Contained-In Policy Requirements

The NYSDEC has developed a guidance document for managing listed hazardous waste. The document (NYSDEC TAGM#3028, November 1992), is entitled "Contained-In" Criteria for Environmental Media. This contained-in policy applies to soil, sediment and groundwater contaminated by listed hazardous waste and removed pursuant to a corrective action plan. Soil Action Levels in the contained-in policy are protective of human health and the environment and are calculated based on the direct human ingestion exposure pathway. The contained-in policy was used to manage the excavation, handling, and disposal of soils from the site. The application of the contained-in policy is discussed in detail in the IRM report.

3.1.1.3 NYSDEC Soil Cleanup Objectives

The NYSDEC has developed a guidance document for the cleanup of inactive hazardous waste sites. The document (NYSDEC TAGM#4046, January 1994), is entitled Determination of Soil Cleanup Objectives and Cleanup Levels. The NYSDEC soil cleanup objectives were used as soil cleanup criteria and are discussed in the IRM report.

3.1.2 ARARS for Groundwater

No known drinking water wells are located within one mile of the Former Carborundum Company Facility, and residents and businesses in the Town of Niagara and City of Niagara Falls are supplied by a municipal water source. In addition, groundwater flow is toward the Niagara River, which is the closest receiving surface water body and is located 6500 feet west of the site. Due to dilution and sorption, the impact of COCs on the Niagara River are not considered significant or measurable. Therefore, federal drinking water standards are not considered applicable.

The NYSDEC Groundwater Standards and Guidance Values will be used as groundwater cleanup criteria. These values are derived from standards found in 6 NYCRR Part 703.5, or for

the cases where no standards exist, from the Division of Water Technical and Operational Guidance Series 1.1.1 (TOGS 1.1.1).

3.2 REMEDIAL ACTION OBJECTIVES

Remedial action objectives have been developed for the site and are discussed below. Remedial action objectives were developed to evaluate methods of protecting human health and the environment. Based on the results of the risk assessment, the former Carborundum Company facility is not considered a threat to either human health or the environment in its current condition. However, soil and groundwater on the site do contain contaminants of concern above NYSDEC soil cleanup objectives and groundwater standards.

The remedial action objectives developed to address soil and groundwater contamination on the site include:

1. Remove contaminants from on-site soils to meet NYSDEC Soil Cleanup Objectives. This soil remediation was achieved by removing the on-site source of shallow groundwater contamination. This objective was met during execution of the IRM, except for a few small areas, described in Section 7. The NYSDEC gave support for the IRM in an Interim Remedial Measure Decision Document dated January 1999.

2. Reduce contaminant concentrations in groundwater in the short-term. Ultimately, the objective is to remediate contaminated groundwater to meet NYSDEC Groundwater Standards/Criteria. The short-term objective will likely be attained through removal of the source of on-site contamination conducted during the IRM. This is considered a reasonable objective that will create a reduction in contaminant concentrations with time in the immediate vicinity of the site, particularly in shallow groundwater in the overburden. This objective for groundwater meets the goal of ensuring continued protection of human health and the environment and attaining an overall reduction in groundwater contaminant concentrations with time.

3.3 SOIL CLEANUP OBJECTIVES AND GROUNDWATER STANDARDS/CRITERIA

Soil Cleanup Objectives used during the IRM were NYSDEC TAGM 4046, described in the IRM report. These objectives were met during execution of the IRM, except in a few small areas described in Section 7.

DE&S and the NYSDEC established a PAH clean-up objective of 25 ppm total PAHs for soil in areas 1A and 1C during execution of the IRM. This objective was established on June 16, 1999 because clean-up objectives for some individual PAH compounds are quite low and difficult to achieve given the widespread occurrence of PAHs in industrialized areas. Given the historical, current and future use of the property as an industrial site, the likelihood of human exposure to contaminated soil through ingestion and other routes of exposure considered for health-based criteria is very low. Therefore, the 25 ppm total PAHs clean-up objective was considered protective of human health and the environment, and reasonably achievable at an industrial facility.

NYSDEC Groundwater Standards/Criteria are provided in Table 3.1. Groundwater criteria were derived from 6 NYCRR Part 703.5 and/or Division of Water Technical and Operational Guidance Series 1.1.1.

TABLE 3.1 Groundwater Standards/Criteria (µg/L)

Contaminants of Concern	NYSDEC Groundwater Standards/Criteria
VOCs	
Acetone	50
1,2-Dichloroethene	5
1,1-Dichloroethane	5
Ethyl Benzene	5
Toluene	5
Trichloroethene	5
Vinyl Chloride	2
Xylenes	5
Semi VOCs	
Acenaphthylene	50
Anthracene	50
Benzo(a)Anthracene	0.002
Benzo(b)Fluoranthene	0.002
Benzo(k)Fluroanthene	0.002
Benzo(a)Pyrene	ND
Chrysene	0.002
Fluoranthene	50
Fluorene	50
Indeno(1,2,3cd)Pyrene	0.002
Napthalene	10
Phenanthrene	50
Pyrene	50

ND = not detectable

4. IDENTIFICATION AND PRELIMINARY SCREENING OF TECHNOLOGIES

General technology categories that may be appropriate for remediation of groundwater at the former Carborundum Company facility are identified in Section 4.1. Section 4.2 provides a preliminary screening of the identified technologies. A list of potential alternatives for further evaluation is provided in Section 4.3. Soil remediation was addressed through execution of the IRM in 1999. Support for the IRM was documented by the NYSDEC in an Interim Remedial Measure Decision Document dated January 1999. Details and results of the IRM are provided in a report entitled "Execution of the Interim Remedial Measure for the Former Carborundum Company – Electric Products Division, Hyde Park Facility, Town of Niagara, Niagara County, New York," December 1999. Because the IRM for soil has been successfully completed, no further action will be considered for soil.

4.1 GENERAL TECHNOLOGY CATEGORIES

Contaminated groundwater is to be remediated by source removal and evaluation of treatment technologies. The goal for groundwater is to attain an overall reduction in contaminant concentrations with time and to meet NYSDEC Groundwater Standards/Criteria. General technology categories that were considered to achieve this goal include:

GW-1 No-Action
GW-2 Institutional Controls
GW-3 Removal of Groundwater by Pumping
GW-4 Containment
GW-5 Treatment

Table 4.1 provides a summary of remedial technologies and process options for groundwater.

Table 4.1 Remedial Technologies and Process Options for Groundwater

General Technology Category	Remedial Technology	Process Option	Option ID
No-Action	None	None	GW-1
Institutional Controls	Access Restrictions to Property	Deed/Well Restrictions	GW-2a
	Monitoring	Groundwater Monitoring	GW-2b
Removal of Groundwater by Pumping (requires treatment of extracted groundwater)	Groundwater Pumping/Extraction	Vertical pumping wells	GW-3a
		Horizontal pumping wells	GW-3b
Containment	Capping	Synthetic Membrane	GW-4a
		Soil/Clay cap	GW-4b
		Asphalt/Concrete	GW-4c
	Vertical Barriers	Slurry Wall/Grout Curtain	GW-4d
		Sheet Piling	GW-4e
Treatment	Contaminant Removal for Ex-Situ Treatment	Groundwater Flushing	GW-5a
		Air Sparging/Vapor Extraction	GW-5b
	In-Situ Treatment	Microbial Degradation	GW-5c
		Zero-Valent Metal	GW-5d

4.2 PRELIMINARY SCREENING OF REMEDIAL TECHNOLOGIES

Potential remedial technologies identified in Table 4.1 have been evaluated during a preliminary screening process. This preliminary screening identifies those technologies best suited for further consideration as a remedial alternative and eliminates those technologies that have severe limitations due to site conditions or are not feasible for attaining remedial action objectives.

Criteria used during the preliminary screening process include:

1. Can the proposed remedial technology achieve the cleanup goals for this site?
2. Can the proposed remedial technology be used given the nature of the contaminants and subsurface materials found at this site?
3. Can the proposed remedial technology be used given the logistical and spatial restrictions at this site?

Table 4.2 provides a brief description of each process option and indicates whether each option is retained for further evaluation as a potential alternative.

Table 4.2 Screening of Remedial Technologies and Process Options for Groundwater

General Technology Category	Remedial Technology	Process Option (Option ID)	Description	Screening Comments
No-Action	**None**	**None (GW-1)**	No action taken	**Retained as option**
Institutional Controls	**Access Restrictions to Property**	**Deed/Well Restrictions (GW-2a)**	Restrictions to industrial land use, including restrictions on well installation and water use	**Potentially applicable**
	Monitoring	**Groundwater Monitoring (GW-2b)**	Continue on-going groundwater monitoring to evaluate trend of natural degradation of contaminants	**Potentially applicable**
Removal of Groundwater by Pumping with Treatment	**Groundwater Pumping/Extraction**	**Vertical Pumping Wells (GW-3a)**	Install dense network of pumping wells to extract contaminated groundwater	**Potentially applicable**
		Horizontal Pumping Wells (GW-3b)	Install network of horizontal wells to extract contaminated groundwater	**Potentially applicable**
Containment	Capping	Synthetic Membrane (GW-4a)	Cover soil with an impermeable membrane	Not applicable due to low durability in traffic areas
		Soil/Clay cap (GW-4b)	Application of bentonite/clay over soil	Not applicable due to low durability in traffic areas
		Asphalt/Concrete (GW-4c)	Install layer of asphalt/concrete to prevent migration/contact	**Potentially applicable**
Containment	Vertical Barriers	Slurry Wall/Grout Curtain (GW-4d)	Trench filled with low-permeability slurry or grout installed around plume	Not applicable – limits of plume not defined or covers very large area
		Sheet Piling (GW-4e)	Installation of sheet piling around on-site plume	Not applicable – limits of plume not defined or covers very large area
Treatment	**Contaminant Removal for Ex-Situ Treatment**	Groundwater Flushing (GW-5a)	Inject treated groundwater upgradient and pump downgradient to enhance movement	Not applicable – not well proven for chlorinated solvents
		Air Sparging/Soil Vapor Extraction (GW-5b)	Air is used to strip VOCs from groundwater in-situ. Requires treatment of extracted vapors.	**Potentially applicable**

General Technology Category	Remedial Technology	Process Option (Option ID)	Description	Screening Comments
	In Situ Treatment	Microbial Degradation (GW-5c)	Degradation of organics in-situ using nutrients and biological agents	Not applicable – not effective for low concentrations of chlorinated solvents
		Zero-Valent Metal (GW-5d)	Installation of a metal-filled trench downgradient of the plume that allows water to flow through it and reduces contaminants to less toxic compounds	**Potentially applicable**

NOTE: Technologies/Options indicated in BOLD have been identified during preliminary screening as potentially applicable.

4.3 POTENTIAL ALTERNATIVES FOR GROUNDWATER

Preliminary screening of remedial technologies indicates that the following technologies/options from Table 4.2 are potentially applicable as remedial alternatives for groundwater at the former Carborundum Company site:

GW-1	No Action
GW-2a	Institutional Controls such as access restrictions to the property using deed or well restrictions
GW-2b	Groundwater Monitoring of natural degradation of contaminants
GW-3	Removal of Groundwater by Pumping via a pumping well network of vertical wells (GW-3a) or horizontal wells (GW-3b) [requires subsequent treatment of contaminated water].
GW-4c	Containment by capping using an asphalt/concrete cap
GW-5b	Treatment - removal of contaminants by air sparging/soil vapor extraction using volatilization of VOCs (requires treatment of extracted vapors).
GW-5d	Treatment – in-situ treatment of contaminants using a zero-valent metal to dechlorinate COCs as they move through a permeable wall

Remedial alternatives are further screened and developed in Section 5.

5. GROUNDWATER ALTERNATIVES SCREENING AND DEVELOPMENT

This section provides a more thorough screening of potential alternatives for groundwater remediation identified in Section 4.3. This screening evaluates potential alternatives that have been retained for technical merit and evaluates them from a financial and implementation view point. This includes an evaluation of technical effectiveness; implementability, including potential community acceptance of the technology; and relative cost. Relative costs and information on time-frame for cleanup are provided for budgetary purposes only. Accurate estimates of cost and cleanup times cannot be made without site-specific pilot testing of proposed technologies and detailed design work, which has not been performed at the site.

5.1 POTENTIAL ALTERNATIVES SCREENING FOR GROUNDWATER

Potential alternatives determined to be technically feasible and implementable include:

GW-1 No Action

GW-2 Institutional controls

- Access restrictions (GW-2a)
- Groundwater monitoring (GW-2b)

GW-3 Removal of Groundwater by Pumping with Treatment

- Pumping groundwater via vertical wells (GW-3a)
- Pumping groundwater via horizontal wells (GW-3b)

GW-4 Containment of Contaminants

- Capping of site using asphalt/concrete (GW-4c)

GW-5 Contaminant Removal for Ex-Situ Treatment

- Air Sparging/Vapor Extraction (GW-5b)
- In-Situ Treatment Using Zero-Valent Metal (GW-5d)

The potential alternatives for groundwater remediation at the former Carborundum Globar facility are listed in Table 5.1. This table also provides summaries of predicted effectiveness, implementability, and relative cost for each alternative.

Table 5.1 Summary of Groundwater Alternatives Screening

Process Option	Effectiveness	Implementability	Total Cost[1] (capital) [O&M]	Recommendation
No-Action (GW-1): No action taken	Not effective in removing contaminants. However, risk is low for exposure or health effects	Easily implemented	$0 ($0) [$0]	Retain for further evaluation as alternative
Access Restrictions (GW-2a): Access restrictions to property and groundwater including deed and well/water restrictions for future land use	Not effective in removing contaminants. Would maintain low potential for exposure or health effects.	Easily implemented through legal and administrative processes	$25K ($25K) [$0]	Retain for further evaluation as alternative
Groundwater Monitoring (GW-2b): Continued periodic monitoring of groundwater quality. May also require additional well installation	Not effective in removing contaminants. Would provide more data on fate of contaminants in subsurface and on natural degradation processes.	Easily implemented using existing monitoring wells, may require additional wells.	$750K ($50K) [$700]	Retain for further evaluation as alternative
Removal Using Vertical Wells (GW-3a): Extraction of contaminated groundwater using vertical pumping wells. Requires treatment/disposal	Effectiveness dependent on site hydrogeology. Option is less effective in fine-grained and heterogeneous soils.	Moderate difficulty in implementation due to the need to install a dense network of pumping wells.	$6M ($4M) [$2M]	Retain for further evaluation as alternative
Removal Using Horizontal Wells (GW-3b): Extraction of groundwater using horizontal wells. Requires treatment/disposal	Effectiveness dependent on site hydrogeology. Option is less effective in fine-grained and heterogeneous soils.	Difficult implementation due to the need for specialized equipment	$8M ($6M) [$2M]	Eliminate option due to difficult implementation and high cost with no increased effectiveness over vertical wells.
Asphalt Capping (GW-4c): Capping technologies reduce surface infiltration and thereby slow contaminant movement off-site.	Does not remove contaminants from the site. Reduces exposure, but exposure to groundwater is already low.	Easily implementable using standard construction methods	$70K ($10K) [$60K]	Retain asphalt/concrete cap for further evaluation as alternative

Process Option	Effectiveness	Implementability	Total Cost[1] (capital) [O&M]	Recommendation
Air Sparging/Vapor Extraction (GW-5b): air is used to strip VOCs from groundwater in-situ. Requires treatment of extracted vapors.	Effective for VOCs, however, effectiveness in heterogeneous, fine-grained soils and fractured bedrock is significantly reduced.	Difficult to implement due to the need to install a dense network of sparging and extraction wells. Sparging in fractured bedrock is extremely difficult and uncertain	$5M ($3M) [$2M]	Retain for further evaluation as alternative
In-Situ Treatment Using Zero-Valent Metal (GW-5d): This options requires the installation of a subsurface trench to bedrock, similar to a slurry wall; however, the trench is filled with permeable zero-valent metal that will degrade contaminants to less toxic compounds.	Effective for VOCs, however, effectiveness in heterogeneous, fine-grained soils and fractured bedrock is significantly reduced. Must be anchored to bedrock.	Difficult due to the need for specialized equipment to reach deep depths and to penetrate bedrock. Site layout is such that a downgradient barrier is not feasible without demolition of buildings.	$10M ($8M) [$2M]	Eliminate option due to difficult implementability.

[1] **NOTE: Costs were estimated by adding estimated capital costs and estimated, present-day, 30-year operation and maintenance (O&M) costs.**

5.2 DEVELOPMENT OF ALTERNATIVES

Remedial technologies retained for further evaluation from above have been grouped into remedial alternatives or strategies and evaluated based on relative effectiveness, relative implementability, and relative cost. Alternatives for groundwater that were retained for further evaluation include no action, access restrictions, groundwater monitoring, removal of groundwater using vertical wells, removal of groundwater using horizontal wells, asphalt/concrete capping, removal of contaminants using air sparging/vapor extraction, and in-situ treatment using zero-valent metal.

5.2.1 No Action (GW-1)

No action is easily implemented and inexpensive; however, this alternative will not remove contaminants from the site. No remedial costs would be incurred with this option. Although risk assessment work has indicated that there is little to no health impact from contaminants in groundwater, this option is believed to be unfavorable to the local community. Due to predicted unfavorable community response, this option is eliminated from further consideration.

5.2.2 Institutional Controls (GW-2)

Institutional controls include using legal or physical means to restrict or limit access to the property.

5.2.2.1 Access Restrictions (GW-2a)

Access restrictions includes installing physical restrictions to limit access to the property, and using deed restrictions or water use/well installation restrictions that will control future land/water use. Costs incurred would be minimal, consisting of initial legal fees to implement deed restrictions. This type of management will not remove contaminants from the site. Groundwater at the site is not used as a source of potable water and there are no known wells in the area. Because the likelihood of exposure to contaminants in groundwater is already very low, this option will provide no significant benefit over the no-action alternative. However, this option is retained for further consideration as an administrative option.

5.2.2.2 Groundwater Monitoring (GW-2b)

Groundwater monitoring is periodic monitoring of groundwater quality on site. While this option will not actively remove contaminants from the site, it will allow an evaluation of the expected natural degradation and reduction of contaminants following removal of the source of groundwater contamination. Some remediation of groundwater contamination will be achieved following removal of the source of local contamination (i.e., soil remediation) and on-going natural degradation of contaminants. This will create a reduction over time in levels of groundwater contamination in the immediate vicinity of the site, especially in the overburden. The groundwater monitoring option will allow an observation of this decline in contaminant concentrations with time. Time required to achieve a decline in contaminant concentrations to below NYSDEC Groundwater Standards/Criteria depends on site-specific geochemical conditions. These conditions will be investigated during groundwater monitoring; however, the time-frame is estimated to be between 5 and >50 years.

This alternative is readily implemented because monitoring wells already exist on the site. Additional wells may be required to fill data gaps. Costs are low relative to groundwater treatment methods. Capital costs for well installation are estimated to be $50,000. A yearly sampling cost is estimated to be $23,000. The estimated, 30-year, present-day cost for this option is $750,000. This option will be retained for further consideration as an alternative.

5.2.3 Removal Using Vertical Wells (GW-3a)

Removal using vertical wells involves pumping contaminated groundwater from the subsurface using wells. The water removed from the subsurface must then be treated prior to disposal. Treatment of the water can be performed using air stripping or granular activated carbon. Treated water can be disposed in the local sewer system if a permit is granted. Due to the shallow depth to groundwater and the fine-grained nature of soils, it is unlikely that reinjection of treated water will be feasible.

Groundwater removal by pumping is most effective in coarse-grained, homogeneous soil that allows water to flow through and dissolve contaminants efficiently. Groundwater remediation by

pumping is achieved by designing a network of pumping wells that will lower the water table near the wells, creating a steep groundwater gradient that will draw contaminants into the well. The network of wells is designed such that the area of groundwater that is influenced by pumping encapsulates the plume of contamination. The fine-grained and heterogeneous soils and fractured bedrock at the site make pumping inefficient as a means of contaminant removal. Heterogeneity decreases the possibility of permanent cleanup because residual contaminants in fine-grained areas will tend to stay sorbed onto subsurface particles rather than diffusing into the water. This tends to leave pockets of residual contaminants that will serve as a continuing source of contamination. When the pumping system is shut down, these contaminants will diffuse into the surrounding groundwater, causing a rebound of contaminant concentrations. This cycle can be repeated for decades before cleanup is achieved. Similarly, contaminants can remain trapped in small, poorly connected fractures in bedrock and act as a residual source of contamination.

A very dense network of pumping wells would be needed to lower the water table on-site enough to remove contaminated groundwater from the entire area of the site because the radius of influence of each well in fine-grained soils is small (estimated to be less than 100 ft). Radius of influence of site-specific wells would need to be determined through pilot testing prior to system design. Assuming an approximate radius of influence of 100 ft, hundreds of wells could be required to remove contaminated groundwater from the site. Capital costs for pumping well and treatment system installation are estimated to be $4million. Estimated costs for 30 years of operation and maintenance are estimated to be $2million. Time for cleanup is estimated to be between 5 and >50 years.

Due to the fine-grained and heterogeneous nature of on-site geological conditions and the regional extent of groundwater contamination, it is not likely that any type of groundwater pumping will be feasible for groundwater cleanup within a reasonable time frame (less than 50 years). Potential community acceptance of groundwater pumping is unknown, but is likely unfavorable due to the uncertainty of results and long time frame for cleanup. Due to difficulties in implementation and limited effectiveness, this option will not be considered further.

5.2.4 Removal Using Horizontal Wells (GW-3b)

Removal using horizontal wells involves pumping contaminated groundwater from the subsurface using wells. The only difference between this option and the option using vertical wells is the orientation of the extraction wells. Horizontal wells will allow a slightly improved area of influence for each well, but may not be able to attain the same effective depth as vertical wells. Costs and time frame for cleanup are estimated to be similar to those for vertical wells, with slightly higher capital expenses due to more expensive drilling methods. Due to similar difficulties in implementation and limited effectiveness due to the fine-grained and heterogeneous nature of soils on site, this option is also eliminated from further consideration.

5.2.5 Asphalt/Concrete Capping (GW-4c)

Capping does not remove contaminants from the site, but reduces exposure by installation of a physical barrier over the area of contamination. Capping also reduces infiltration of precipitation that can contribute to the movement of contaminants downward from soil into groundwater. This method is effective in reducing potential human health effects due to exposure; however, at this site human health effects are already negligible, so this option will add no real remedial value. It should be noted that the majority of the area of overburden groundwater contamination is already covered by asphalt parking lots, roads, sidewalks, etc and/or buildings. Contamination in deeper bedrock is more than 17 feet below ground surface, so capping would provide no real additional protection in areas of bedrock groundwater contamination. Costs are estimated to be low, consisting of an initial expenditure of $10,000 for paving and an estimated 30-year cost of $60,000 for asphalt repair and maintenance. Due to the lack of real value realized by implementing this option, it will not be considered further.

5.2.6 Air Sparging/Vapor Extraction (GW-5b)

Air sparging is a method where air is injected into subsurface groundwater below the bottom of the contaminant plume via sparging wells. As the air bubbles upward through the plume of contaminated groundwater, VOCs are partitioned from the water into the air. The VOC-laden air then moves into the shallow unsaturated zone, where it is removed via vapor extraction wells. Vapors then require treatment prior to release. This technology is proven effective for removal

of VOCs; however, its effectiveness is dependent on the ability of air to flow throughout the contaminated area. At this site the fine-grained and heterogeneous nature of soils and the presence of fractured bedrock will significantly reduce the effectiveness of this technology. Heterogeneity decreases the possibility of permanent cleanup because residual contaminants in fine-grained areas will tend to stay sorbed onto subsurface particles rather than diffusing into the air stream. This tends to leave pockets of residual contaminants that serve as a continuing source of contamination. When the sparging system is shut down, these contaminants will diffuse into the surrounding groundwater, causing a rebound of contaminant concentrations. This cycle can be repeated for decades before any cleanup is achieved. In addition, like groundwater pumping, the fine-grained and heterogeneous nature of soils would require the use of a very dense network of sparging/extraction wells.

Cleanup of contamination in the bedrock would be impractical using this technology, because of the difficulty in moving air efficiently through a heterogeneous network of fractures. The potential community acceptance of this technology is unknown, but is not likely to be favorable due to the uncertainty of results and long time-frame for cleanup. Assuming an approximate radius of influence of 100 ft for extraction and sparging wells, hundreds of wells could be required to remove contaminants from the site. Capital costs for well and treatment system installation are estimated to be $3million. Estimated costs for 30 years of operation and maintenance are estimated to be $2million. Time for cleanup is estimated to be between 5 and >50 years. Due to difficulties in implementation and limited effectiveness, this option will not be considered further.

5.2.7 In-Situ Treatment Using Zero-Valent Metal (GW-5d)

Reactive barriers are in-situ passive systems that allow groundwater to naturally pass through for treatment. Zero-valent metal technology has proven effective in destruction of chlorinated solvents. It is mechanically simple, long term, and cost effective for treatment of groundwater containing chlorinated solvents. The zero-valent metal formulation in the in-situ barrier causes chlorine atoms to be replaced by hydrogen atoms, effectively destroying chlorinated solvent compounds. The metal formulation is installed as a permeable treatment wall in an excavated

trench across the flow path of a plume of VOC-contaminated groundwater. The VOCs are transformed by reductive dehalogenation as they migrate through the wall. The layout of the property limits the location of the wall to the western and southern property boundaries, unless the building was demolished. However, the extent of groundwater contamination extends beyond the western and southern boundaries, limiting the ability of this technology to effectively clean up contaminated groundwater in the area unless the barrier was installed off-site. In addition, difficulties in trenching into bedrock to achieve cleanup of deeper bedrock groundwater make implementation very difficult. Assuming a barrier trench length of 720ft, a depth of 30 ft, and a thickness of 3 ft and assuming that the property would be purchased and the building demolished to accommodate trench installation, capital costs for system installation are estimated to be $8million. Estimated costs for 30 years of operation and maintenance are estimated to be $2million. Time for cleanup is estimated to be between 5 and >50 years. Due to difficult implementation and limited effectiveness in bedrock, this technology will not be considered further.

6. RECOMMENDED ALTERNATIVES

This section discusses the recommended alternatives for groundwater and how each alternative meets ARARS.

6.1 GROUNDWATER MONITORING AND DEED RESTRICTIONS

Two major factors impact the ability of currently available groundwater remediation technologies to reduce contaminant concentrations below the NYSDEC Groundwater Standards/Criteria:

1. The potential presence of off-site, upgradient sources of contamination, and
2. The fine-grained and heterogeneous nature of on-site soils and the presence of fractured bedrock.

Removal of contaminated soils during the IRM removed potential on-site sources of contaminants to groundwater; however, potential off-site sources may remain that could continue to contribute to groundwater contamination. A groundwater remediation system that involves removal or extraction of contaminants may not achieve cleanup if off-site sources remain that will continue to contribute contaminants to groundwater.

The remedial action objective for groundwater is to reduce contaminant concentrations in groundwater in the short-term. Ultimately, the objective is to remediate contaminated groundwater to meet NYSDEC Groundwater Standards/Criteria. The short-term objective will likely be attained through removal of the source of on-site contamination conducted during the IRM. This objective meets the goal of ensuring continued protection of human health and the environment and attaining an overall reduction in groundwater contaminant concentrations with time.

The alternatives for groundwater that were evaluated in Section 5.0 included no action, access restrictions, groundwater monitoring, removal using horizontal wells, air sparging/vapor extraction, and asphalt/concrete capping. Of these alternatives, only groundwater monitoring and deed restrictions were retained as viable options for groundwater. Removal using horizontal

wells and air sparging/vapor extraction involve removal or extraction of contaminants that would be impractical given current site conditions. Because exposure to groundwater contaminants is minimal and most of the site is already covered by asphalt/concrete surfaces or buildings, asphalt/concrete capping is not an alternative that will provide any additional protection compared to current on-site conditions. No action is a viable alternative, but BP America wishes to take reasonable and practical steps to ensure that groundwater contamination on the former Carborundum Company property is managed appropriately.

The groundwater monitoring option will allow an evaluation of groundwater condition with time. This monitoring information can be used by BP America and the NYSDEC to evaluate the need for any further action at the site. Deed restrictions can be used in combination with groundwater monitoring as a management option for the site.

Monitoring should consist of periodic groundwater sampling for a specific monitoring period of several years to document on-site groundwater conditions as they change with time. At the end of the specified monitoring period, the need for further monitoring should be evaluated. Monitoring frequency and other details will be provided at a later date in a detailed groundwater monitoring plan.

6.2 COMPLIANCE WITH ARARS

The IRM for soil complied with the ARARS identified in Section 3 for soil. Contaminated soils were removed from identified areas of contamination and backfilled with clean material so that soils on the site comply with the NYSDEC Soil Cleanup Objectives. There are some exceptions to this, which are described in Section 7.

The groundwater monitoring and deed restrictions alternative may not result in compliance with ARARS through cleanup of groundwater to meet NYSDEC Groundwater Standards/Criteria in less than 50 years. However, due to the potential presence of continuing sources of groundwater contamination upgradient from the site and to the complicated geology of the site, more

aggressive and costly cleanup options may not effectively result in compliance with the ARARS in less than 50 years, either.

7. SUMMARY OF IRM RESULTS

An Interim Remedial Measure (IRM) has been implemented in cooperation with the NYSDEC for contaminated soils at the former Carborundum Company facility. The IRM included excavation of contaminated soils from the site and off-site disposal at RCRA approved Part 360 and 373 landfills. This alternative was determined to be better than other evaluated alternatives because of its low cost, permanence, effectiveness, ease of implementation, acceptance by the community and because excavation is a remedy that will remove contaminants from the site immediately. The NYSDEC supported the IRM in a document entitled Interim Remedial Measure Decision Document, dated January 1999. By removing contaminated soils from the site, identified sources of potential groundwater contamination were also removed from the former Carborundum Company property.

The overall objective of the IRM was to affect an improvement in groundwater quality with time following source removal. The IRM report (DE&S, 1999c) provides more detailed results.

The specific objectives of the IRM included:

i) Refine the extent of known soil contamination to allow cost-effective and efficient removal of soils. This objective was achieved through a borehole drilling and soil sampling program to refine the extent of contamination.

ii) Excavate contaminated soils and test to determine appropriate disposal options. This objective was achieved through a test pit program that allowed pre-characterization of soils for disposal.

iii) Dispose of soil at appropriate facility.

The plans and specifications and health and safety plan document developed for the IRM soil excavation program includes a description of the air quality monitoring program, which meets

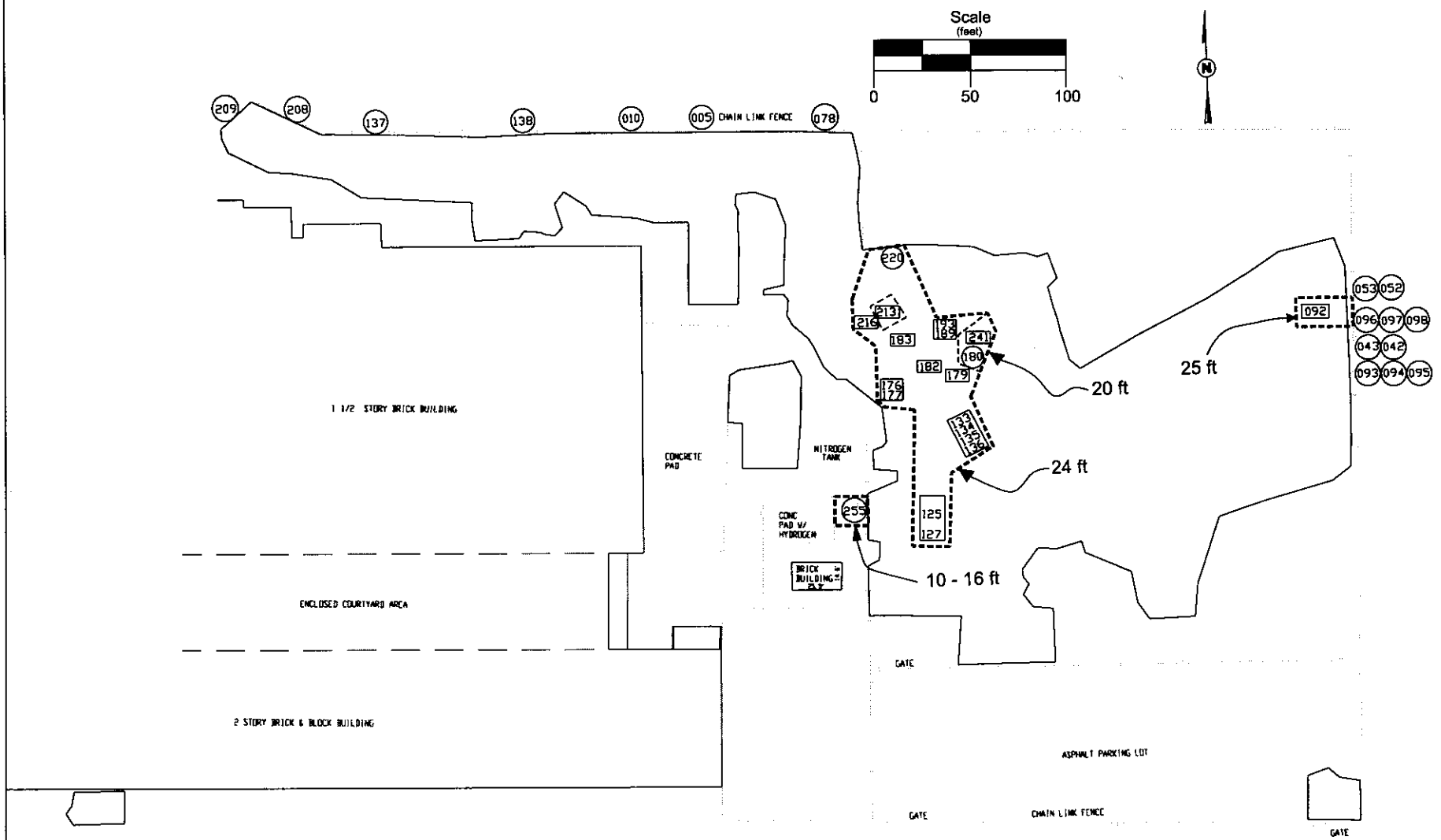
the NYSDOH Community Air Monitoring Plan and the NYSDEC TAGM #4031 for dust control.

A total of 35,606 tons, or approximately 23,700 yd^3 of soil including 2,150 tons of action level soils was excavated and removed from the site between May and August 1999. A total of 307,600 gallons of excavation water, groundwater that had seeped into the excavations, was disposed and treated at the City of Niagara Falls Wastewater Treatment Plant.

The goal of the IRM was to remove contaminated soils from the site. This was achieved, however, verification sampling results indicate that a few areas of soil remaining on the site contain COC's above cleanup objectives. This is due to site conditions that prevented the removal of all contaminated soils from the site in some areas. Areas where contaminated soils remain on-site include: Areas 1A/1C, 1D-extension/2C and 2A (see IRM report, DE&S, 1999c). Figure 7-1 depicts the remaining areas of soil contamination on site. Verification soil samples (see IRM report for specific information on sample numbers and results) collected from the floors and walls of the excavations that contain COC concentrations above NYSDEC Soil Cleanup Objectives are depicted on the figure.

Several verification samples collected from the north wall of areas 1A/1C exceeded the clean-up objective for trichloroethene and/or PAHs. These samples do not represent contaminated soil remaining on-site because the north wall of areas 1A and 1C extended to the north property boundary.

Approximately 700 yd^3 of non-hazardous soil containing VOCs remains on-site below 20ft in depth in areas 1D-extension/2C. Verification sampling results also indicate that one verification sample contains vinyl chloride above the action level in area 1D-extension on the floor below the former location of the solvent storage area at 24 ft depth. An estimated 40 yd^3 of action level soil remains on-site at this location. Additional excavation in these locations was not possible because of significant concern for reduced slope stability near the liquid nitrogen above-ground storage tank (AST) that prevented extension of the excavation below 24 ft depth.



Note:

All samples displayed exceed cleanup objectives.
Samples 213 an 043 exceed action level for vinyl chloride.

Figure #:	Remaining Areas of Soil Contamination
7.1	

Project #:	Date:	Drawn by:	File Name:
TM8097	August 18, 1999	MSM	Fig7_1_FS99.dwg

Legend

- Estimated extent of remaining contamination
- Top of bank - actual excavation
- 0 - 2 ft Approximate depth range of contamination
- ○ Wall Sample
- □ Floor Sample

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Verification sampling results indicate that non-hazardous soil remains in area 2A in four locations: at the east wall corresponding to the property boundary from 0 to 16 ft in three samples, on the west wall near the hydrogen gas cylinders from 10 to 16 ft in one sample, on the floor in the north-east corner in one sample at 24 ft, and the floor in the west end in six samples at 18 to 24 ft.

Excavating further east in Area 2A was not conducted because the excavation extended to the east property boundary. An estimated 800 ft^2 area of non-hazardous soil remains between 0-16 ft in depth on the east property boundary. Excavating further west was not possible due to the proximity of the hydrogen gas cylinders. An estimated 60 yd^3 of non-hazardous soil remains between 10-16 ft in depth on the west wall. Excavating deeper than 24 ft in the north-east corner was not possible because of significant concern for reduced slope stability. An estimated 80 yd^3 of non-hazardous soil remains below 24 ft in this area. Excavating deeper than 18 to 24 ft on the floor in the west end was not possible due to the presence of loose sands, silts, gravels and boulders in this area that caused a significant concern for slope stability; the proximity of the hydrogen gas cylinders and the liquid nitrogen AST; and significant groundwater seepage that compounded slope stability issues. The estimated volume of non-hazardous soils remaining on the floor below 18ft depth in the west end of area 2A is 1,100 yd^3.

Verification sampling results also indicate that action level soil remains in area 2A on the east wall in one sample. An estimated 150 ft^2 area of action level soil remains between 10-16 ft depth in this area. Excavating further east was not conducted because the verification sample was collected at the east property boundary.

An estimated total of 1,980 yd^3 of contaminated soil remains on-site at depths below 10 feet. The volume of soil remaining represents approximately 8% of the total volume of identified contaminated soil. The objective of the IRM was to affect an improvement in groundwater quality with time following source removal. Over 90% of contaminated soils have been removed from the property, including over 2,000 tons of action level soil. A significant portion of the

source of contamination to groundwater has been removed from the site, which will allow the objective of the IRM to be attained.

Other soil cleanup technologies such as soil vapor extraction, soil flushing, biodegradation, in-situ vitrification or stabilization cannot reasonably be applied to remediate the small areas of remaining contaminated soils at the site due to site-specific soil conditions that make these technologies technically impractical. The soil alternative that was determined most effective at the site, excavation and removal, was applied until restricted by its physical limitations. The IRM was considered successful; therefore, no further action will be applied to the 1,980 yd^3 of contaminated soil left on-site pending groundwater monitoring results. If groundwater contaminant concentrations are reduced significantly over time, then the goal of the IRM will have been achieved.

Remaining areas of soil contamination on site can be monitored to ensure that they do not have a significant adverse impact on the environment through groundwater monitoring. Groundwater monitoring wells will be installed as part of the FS groundwater monitoring program, in areas where soil contamination remains on site. This will allow an evaluation of the impact of small areas of remaining soil contamination on the condition of groundwater at the site. This impact is not expected to be significant.

8. REFERENCES

DE&S (1999a) Interim Remedial Measure Work Plan for the Former Carborundum Company Electric Products Division, Hyde Park Facility, Town of Niagara, Niagara County, NY. Site No. 932036.

DE&S (1999b) Plans and Specifications for Execution of the Interim Remedial Measure for the Former Carborundum Company Electric Products Division, Hyde Park Facility, Town of Niagara, Niagara County, NY. Site No. 932036.

DE&S (1999c) Execution of the Interim Remedial Measure for the Former Carborundum Company Electric Products Division, Hyde Park Facility, Town of Niagara, Niagara County, NY. Site No. 932036

DE&S (1998) Phase II Remedial Investigation of the Former Carborundum Company Electric Products Division, Hyde Park Facility, Town of Niagara, Niagara County, NY. Site No. 932036.

Earth Dimensions Inc. (1985) Soils Report Preliminary Site Assessment Hyde Park Facility, Carborundum Globar Manufacturing, Niagara Falls, New York.

INTERA (1993) Report on the Preliminary Site Assessment of the Carborundum Company - Electric Products Division, Hyde Park Facility, Town of Niagara, Niagara County, NY. Prepared for The Carborundum Company Site No. 932036.

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NYSDEC (1992) Determination of Soil Cleanup Objectives and Cleanup Levels NYSDEC TAGM HWR-92-4046, November 16, 1992; revised May 5, 1998.

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USEPA (1989) Risk Assessment Guidance for Superfund Volume 1 Human Health Evaluation Manual (Part A) Interim Final. EPA/540/1-89-002.

APPENDIX A

Summary of Soil Sampling

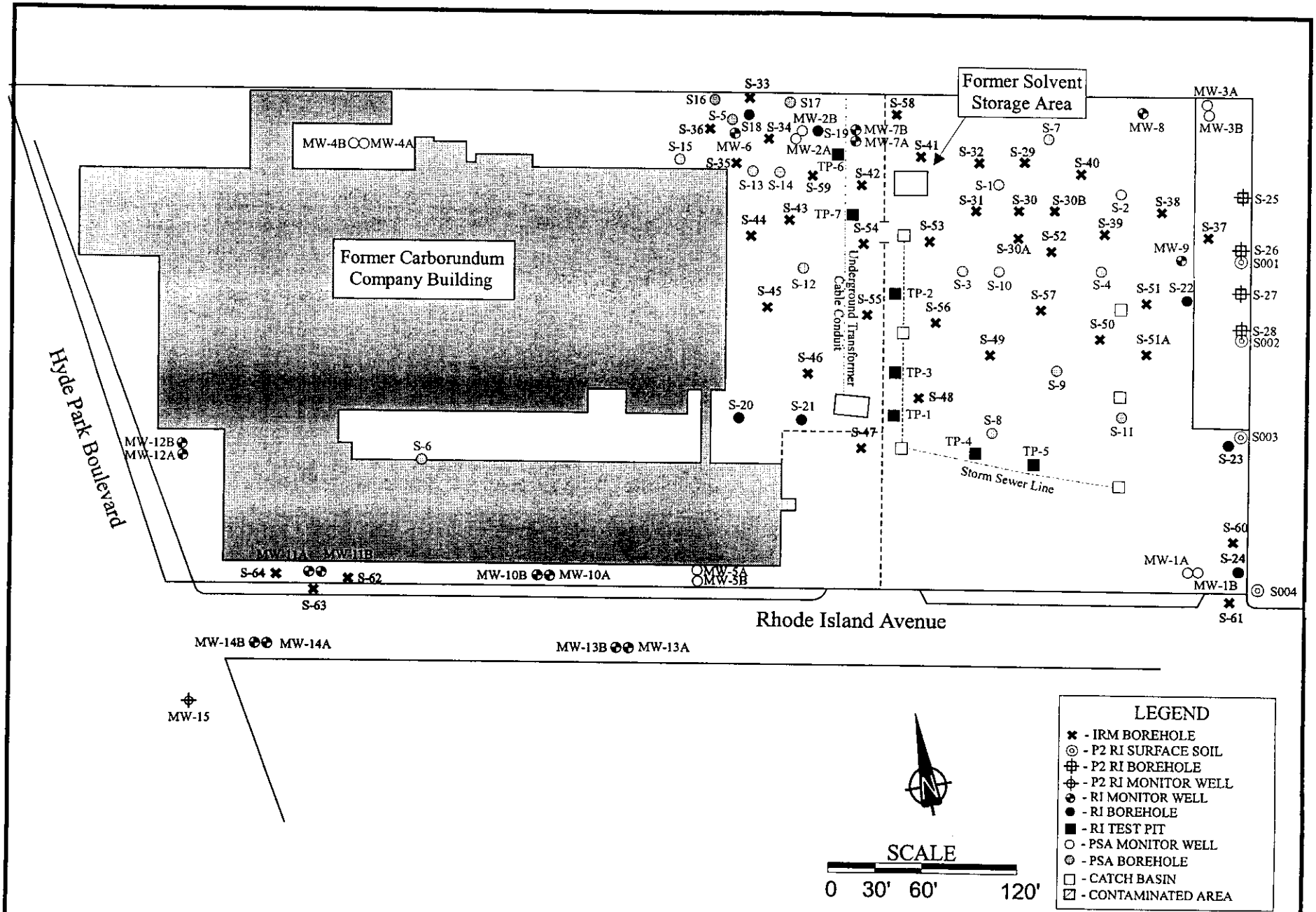


Figure A-1	Job #: TM4085	Borehole Locations	Duke Engineering & Services (Canada), Inc. A Duke Energy Company
Date: Jan 14, 2000	Drawn/File Name: VP/A_1BHloc.cdr	Former Carborundum Company - Electric Products Division	

Summary of VOC Soil Analytical Results from PSA, RI, Phase II RI, and IRM

COC	Well or Borehole No., Soil Sample Depth in ft BGS, and Concentration (µg/Kg)									Cleanup Objective (µg/Kg)[1]	Action Level (µg/Kg)[2]
	MW-1B 0-23.3'	MW-2B 4-6'	MW-3A 0-20'	MW-4B 0.5-23.5'	MW-5B 2-4'	MW-6 0-2'	MW-6 10-12'	MW-7B 0-2'	MW-7B 14-16'		
Vinyl chloride	<11	<51	<13	<11	<13	<10	<10	<5.0	<5.0	200	360
Methylene chloride	<11	<51	<13	<11	<13	12	<10	<5.0	<5.0	150	93,000
Trichloroethene	<11	<51	2J	18	<13	120	75	160	<5.0	880	64,000
Acetone	28	48J	<13	26J	<13	65	<10	<5.0	<5.0	200	$8x10^6$
1,2-Dichloroethene (total *cis* and *trans*)	<11	<51	<13	29	<13	210	<10	1,100	<5.0	410	$2.8x10^6$ (total)
Toluene	<11	<51	<13	<11	<13	5.2J	<10	150	3.1J	2,100	$20x10^6$
Ethyl benzene	<11	370	<13	<11	<13	<10	<10	210	<5.0	7,700	$8x10^6$
Total xylenes	<11	1,200	<13	<11	<13	<10	<10	1,610	<5	1,680	$2x10^8$

Note:

1. Recommended Soil Cleanup Objectives calculated based on 1.4% TOC in soil (NYSDEC TAGM HWR-94-4046, January 24, 1994).
2. Soil Action Level (NYSDEC TAGM #3028, November 30, 1992).
3. When the sample quantitation limit is greater than the clean-up objective, the assumed COC concentration is half of the quantitation limit.

J indicates estimated value.

UJ indicates that the analyte was not detected above the sample quantitation limit and the reported quantitation limit is an estimated quantity.

1,200 Indicates that concentration exceeds recommended soil cleanup objective

1,200 Indicates that concentration exceeds recommended soil cleanup objective *and* soil action levels

Summary of VOC Soil Analytical Results from PSA, RI, Phase II RI, and IRM, contd.

COC	Well or Borehole No., Soil Sample Depth in ft BGS, and Concentration (µg/Kg)									Cleanup Objective (µg/Kg)[1]	Action Level (µg/Kg)[2]
	MW-8 0-2'	MW-8 14-16'	MW-9 0-2'	MW-9 12-14'	MW-10B 18-20'	MW-11B 0.5-2'	MW-11B 6-8'	MW-12B 16-16.8'	MW-13B 0-2'		
Vinyl chloride	<10	<10	<10	<1,600[3]	<10	<1,300[3]	<10	<10	<10	200	360
Methylene chloride	2.8J	<10	<10	<1,600[3]	<10	<1,300[3]	<10	<10	<10	150	93,000
Trichloroethene	3.0J	3.0J	260	3,400	<10	<1,300[3]	<10	<10	<10	880	64,000
Acetone	<10	59	<10	<1,600[3]	51	<1,300[3]	<10	<10	<10	200	$8x10^6$
1,2-Dichloroethene (total *cis* and *trans*)	<10	<10	51	<1,600[3]	4.1J	<1,300[3]	<10	3.5J	<10	410	$2.8x10^6$ (total)
Toluene	<10	<10	16	<1,600	<10	<1,300	<10	<10	<10	2,100	$20x10^6$
Ethyl benzene	<10	<10	<10	<1,600	<10	<1,300	<10	<10	<10	7,700	$8x10^6$
Total xylenes	<10	<10	19	<1,600	<10	9,100	<10	<10	<10	1,680	$2x10^8$

Note:

1. Recommended Soil Cleanup Objectives calculated based on 1.4% TOC in soil (NYSDEC TAGM HWR-94-4046, January 24, 1994).
2. Soil Action Level (NYSDEC TAGM #3028, November 30, 1992).
3. When the sample quantitation limit is greater than the clean-up objective, the assumed COC concentration is half of the quantitation limit.

J indicates estimated value.

UJ indicates that the analyte was not detected above the sample quantitation limit and the reported quantitation limit is an estimated quantity.

1,200 Indicates that concentration exceeds recommended soil cleanup objective

1,200 Indicates that concentration exceeds recommended soil cleanup objective *and* soil action levels

Summary of VOC Soil Analytical Results from PSA, RI, Phase II RI, and IRM, contd.

COC	Well or Borehole No., Soil Sample Depth in ft BGS, and Concentration (µg/Kg)									Cleanup Objective (µg/Kg)[1]	Action Level (µg/Kg)[2]
	MW-13B 10-12'	MW-14A 0-2'	MW-14A 16-18'	S-1F 0.5-4'	S-1N 4-16'	S-2F 0-10'	S-2N 10-16'	S-3F 0-4'	S-3N 8-12'		
Vinyl chloride	<10	<10	<10	400J	4J	<12	<12	<12	<1,400[3]	200	360
Methylene chloride	<10	<10	<10	<60	0.8J	<12	<12	<12	<1,400[3]	150	93,000
Trichloroethene	<10	<10	<10	300,000 J	560	1J	1J	<2J	23,000	880	64,000
Acetone	<10	<10	<10	170	13	<12	9J	40J	6,100	200	$8x10^6$
1,2-Dichloroethene (total *cis* and *trans*)	<10	<10	<10	37,000	360	<12	<12	560	3,300	410	$2.8x10^6$ (total)
Toluene	<10	<10	<10	84,000J	16J	<12	<12	94	10,000	2,100	$20x10^6$
Ethyl benzene	<10	<10	<10	90,000J	39J	<12	<12	140	1,900	7,700	$8x10^6$
Total xylenes	<10	<10	<10	400,000J	110	<12	<12	330	17,000	1,680	$2x10^8$

Note:

1. Recommended Soil Cleanup Objectives calculated based on 1.4% TOC in soil (NYSDEC TAGM HWR-94-4046, January 24, 1994).
2. Soil Action Level (NYSDEC TAGM #3028, November 30, 1992).
3. When the sample quantitation limit is greater than the clean-up objective, the assumed COC concentration is half of the quantitation limit.

J indicates estimated value.

UJ indicates that the analyte was not detected above the sample quantitation limit and the reported quantitation limit is an estimated quantity.

1,200 Indicates that concentration exceeds recommended soil cleanup objective

1,200 Indicates that concentration exceeds recommended soil cleanup objective *and* soil action levels

Summary of VOC Soil Analytical Results from PSA, RI, Phase II RI, and IRM, contd.

COC	Well or Borehole No., Soil Sample Depth in ft BGS, and Concentration (µg/Kg)									Cleanup Objective (µg/Kg)[1]	Action Level (µg/Kg)[2]
	S-4F 10-12'	S-4N 12-14'	S-5F 0-2'	S-5N 6-16'	S-6F 0-8'	S-6N 8-18'	S-7F 0-2'	S-7N 8-10'	S-8F 2-4'		
Vinyl chloride	<13	<12	<1,100[3]	<11	<12	<12	<12	<12	<12	200	360
Methylene chloride	0.9J	1J	<1,100[3]	<11	1J	<12	<12	<12	<12	150	93,000
Trichloroethene	23	23,000	17,000	99	2J	8J	51	3J	<12	880	64,000
Acetone	<13	19J	<1,100[3]	<11	<12	<12	<12	<12	<12	200	$8x10^6$
1,2-Dichloroethene (total *cis* and *trans*)	9J	1,700J	560J	20	<12	<30	33	<12	<12	410	$2.8x10^6$ (total)
Toluene	<13	34	<1,100	<11	<12	<12	<12	<12	<12	2,100	$20x10^6$
Ethyl benzene	7J	120	120J	<11	<12	<12	<12	<12	<12	7,700	$8x10^6$
Total xylenes	4J	150	800J	<11	<12	<12	<12	<12	<12	1,680	$2x10^8$

Note:

1. Recommended Soil Cleanup Objectives calculated based on 1.4% TOC in soil (NYSDEC TAGM HWR-94-4046, January 24, 1994).
2. Soil Action Level (NYSDEC TAGM #3028, November 30, 1992).
3. When the sample quantitation limit is greater than the clean-up objective, the assumed COC concentration is half of the quantitation limit.

J indicates estimated value.

UJ indicates that the analyte was not detected above the sample quantitation limit and the reported quantitation limit is an estimated quantity.

1,200 Indicates that concentration exceeds recommended soil cleanup objective

1,200 Indicates that concentration exceeds recommended soil cleanup objective *and* soil action levels

Summary of VOC Soil Analytical Results from PSA, RI, Phase II RI, and IRM, contd.

COC	Well or Borehole No., Soil Sample Depth in ft BGS, and Concentration (µg/Kg)									Cleanup Objective (µg/Kg)[1]	Action Level (µg/Kg)[2]
	S-8N 10-12'	S-9F 2-4'	S-9N 10-12'	S-10F 2-4'	S-10N 12-14'	S-11F 2-4'	S-11N 12-14'	S-12F 1.5-2'	S-12N 12-14'		
Vinyl chloride	<12	<12	<13	<12	<1,400[3]	<1,300[3]	<13	<1,500[3]	<27	200	360
Methylene chloride	<12	<12	<13	<12	<1,400[3]	<1,300[3]	<13	<1,500[3]	<27	150	93,000
Trichloroethene	9J	<12	23	<12	<1,400[3]	<1,300[3]	<13	9,000	310	880	64,000
Acetone	<12	<12	<13	57	<1,400[3]	<1,300[3]	<13	<1,500[3]	<27	200	$8x10^6$
1,2-Dichloroethene (total *cis* and *trans*)	5J	<12	28	<12	<1,400[3]	<1,300[3]	<13	7,600	255	410	$2.8x10^6$ (total)
Toluene	<12	<12	<13	<12	<1,400	<1,300	<13	300J	<27	2,100	$20x10^6$
Ethyl benzene	<12	<12	<13	20	2,400	<1,300	<13	<1,500	<27	7,700	$8x10^6$
Total xylenes	<12	<12	<13	<12	720J	<1,300	<13	2,900	<27	1,680	$2x10^8$

Note:

1. Recommended Soil Cleanup Objectives calculated based on 1.4% TOC in soil (NYSDEC TAGM HWR-94-4046, January 24, 1994).
2. Soil Action Level (NYSDEC TAGM #3028, November 30, 1992).
3. When the sample quantitation limit is greater than the clean-up objective, the assumed COC concentration is half of the quantitation limit.

J indicates estimated value.

UJ indicates that the analyte was not detected above the sample quantitation limit and the reported quantitation limit is an estimated quantity.

1,200 Indicates that concentration exceeds recommended soil cleanup objective

1,200 Indicates that concentration exceeds recommended soil cleanup objective *and* soil action levels

Summary of VOC Soil Analytical Results from PSA, RI, Phase II RI, and IRM, contd.

COC	Well or Borehole No., Soil Sample Depth in ft BGS, and Concentration (µg/Kg)									Cleanup Objective (µg/Kg)[1]	Action Level (µg/Kg)[2]
	S-14F 1-2'	S-14N 8-10'	S-15F 0.5-2'	S-15N 12-14'	S-16F 0.5-2'	S-16N 6-8'	S-17F 0.5-4'	S-17N 4-14'	S-18 0-2'		
Vinyl chloride	<45	<1,400[3]	<13	<11	<12	<13	<1,400[3]	<12	<30	200	360
Methylene chloride	<45	<1,400[3]	<13	<11	3J	<13	<1,400[3]	<12	<30	150	93,000
Trichloroethene	55	4,000	3J	6J	9J	2J	2,500	4J	210	880	64,000
Acetone	<45	<1,400[3]	<13	<11	<12	<13	<1,400[3]	<12	<30	200	$8x10^6$
1,2-Dichloroethene (total *cis* and *trans*)	<45	380J	<13	<11	<12	<13	<1,400[3]	<12	<30	410	$2.8x10^6$ (total)
Toluene	<45	<1,400	<13	<11	<12	<13	<1,400	<12	86	2,100	$20x10^6$
Ethyl benzene	<45	<1,400	<13	<11	<12	<13	<1,400	<12	<30	7,700	$8x10^6$
Total xylenes	-	-	-	-	-	-	-	-	<30	1,680	$2x10^8$

Note:

1. Recommended Soil Cleanup Objectives calculated based on 1.4% TOC in soil (NYSDEC TAGM HWR-94-4046, January 24, 1994).
2. Soil Action Level (NYSDEC TAGM #3028, November 30, 1992).
3. When the sample quantitation limit is greater than the clean-up objective, the assumed COC concentration is half of the quantitation limit.

J indicates estimated value.

UJ indicates that the analyte was not detected above the sample quantitation limit and the reported quantitation limit is an estimated quantity.

1,200 Indicates that concentration exceeds recommended soil cleanup objective

1,200 Indicates that concentration exceeds recommended soil cleanup objective *and* soil action levels

Summary of VOC Soil Analytical Results from PSA, RI, Phase II RI, and IRM, contd.

COC	Well or Borehole No., Soil Sample Depth in ft BGS, and Concentration (µg/Kg)									Cleanup Objective (µg/Kg)[1]	Action Level (µg/Kg)[2]
	S-18 4-6'	S-19 2-4'	S-19 18-20'	S-20 0-2'	S-20 18-20'	S-21 0-2'	S-21 6-8'	S-22 0.5-2'	S-22 4-6'		
Vinyl chloride	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	200	360
Methylene chloride	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	150	93,000
Trichloroethene	<5.0	<5.0	<5.0	45	2.8J	14	<5.0	71	11	880	64,000
Acetone	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	150	200	$8x10^6$
1,2-Dichloroethene (total *cis* and *trans*)	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	3.4J	<5.0	410	$2.8x10^6$ (total)
Toluene	<5.0	<5.0	17	<5.0	1.3J	2.8J	<5.0	9.6	3.1J	2,100	$20x10^6$
Ethyl benzene	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	3.8J	<5.0	7,700	$8x10^6$
Total xylenes	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	28.2	<5.0	1,680	$2x10^8$

Note:

1. Recommended Soil Cleanup Objectives calculated based on 1.4% TOC in soil (NYSDEC TAGM HWR-94-4046, January 24, 1994).
2. Soil Action Level (NYSDEC TAGM #3028, November 30, 1992).
3. When the sample quantitation limit is greater than the clean-up objective, the assumed COC concentration is half of the quantitation limit.

J indicates estimated value.

UJ indicates that the analyte was not detected above the sample quantitation limit and the reported quantitation limit is an estimated quantity.

1,200 Indicates that concentration exceeds recommended soil cleanup objective

1,200 Indicates that concentration exceeds recommended soil cleanup objective *and* soil action levels

Summary of VOC Soil Analytical Results from PSA, RI, Phase II RI, and IRM, contd.

COC	Well or Borehole No., Soil Sample Depth in ft BGS, and Concentration (µg/Kg)									Cleanup Objective (µg/Kg)[1]	Action Level (µg/Kg)[2]
	S-23 2-4'	S-23 12-14'	S-24 2-4'	S-24 12-14'	S-25 8-10'	S-26 4-6'	S-27 10-12'	S-28 8-10'	S-29 1-2'		
Vinyl chloride	<10	<10	<10	<14	<12	<12	3J	<12	22J	200	360
Methylene chloride	<10	19	<10	<14	-	-	-	-	<6.1	150	93,000
Trichloroethene	<10	130	<10	<14	<6	660	630	<6	39J	880	64,000
Acetone	<10	130	760	130	6J	46J	5J	<12	34J	200	$8x10^6$
1,2-Dichloroethene (total *cis* and *trans*)	<10	<10	<10	<14	<6	26	2,400	<6	75.8J	410	$2.8x10^6$ (total)
Toluene	<10	5.2J	<10	2.3J	<6	150	180	<6	<6.1	2,100	$20x10^6$
Ethyl benzene	<10	<10	<10	<14	<6	13	66	<6	<6.1	7,700	$8x10^6$
Total xylenes	<10	<10	<10	<14	<6	70	220	<6	3.5J	1,680	$2x10^8$

Note:

1. Recommended Soil Cleanup Objectives calculated based on 1.4% TOC in soil (NYSDEC TAGM HWR-94-4046, January 24, 1994).
2. Soil Action Level (NYSDEC TAGM #3028, November 30, 1992).
3. When the sample quantitation limit is greater than the clean-up objective, the assumed COC concentration is half of the quantitation limit.

J indicates estimated value.

UJ indicates that the analyte was not detected above the sample quantitation limit and the reported quantitation limit is an estimated quantity.

1,200 Indicates that concentration exceeds recommended soil cleanup objective

1,200 Indicates that concentration exceeds recommended soil cleanup objective *and* soil action levels

Summary of VOC Soil Analytical Results from PSA, RI, Phase II RI, and IRM, contd.

COC	Well or Borehole No., Soil Sample Depth in ft BGS, and Concentration (µg/Kg)									Cleanup Objective (µg/Kg)[1]	Action Level (µg/Kg)[2]
	S-29 6'	S-29 15'	S-30 1-2'	S-30 12'	S30A 1-2'	S30B 0-1'	S31 1-2'	S31 10'	S32 1-2'		
Vinyl chloride	<6.0	<6.2	<590[3]	<6.1	<630[3]	<6.0	<6.2	<6.0	<6.0	200	360
Methylene chloride	<6.0	<6.2	<590[3]	<6.1	<630[3]	<6.0	<6.2	<6.0	<6.0	150	93,000
Trichloroethene	6.4	69	14,000	110	9,300	71	120J	48	6.8J	880	64,000
Acetone	<7.0	<8.2	<590UJ[3]	<6.1	<630UJ[3]	7.3J	<24	4.0J	<6.0	200	$8x10^6$
1,2-Dichloroethene (total *cis* and *trans*)	4.8J	26	3,000	30.7J	6,510	16	100J	14	2.3J	410	$2.8x10^6$ (total)
Toluene	<6.0	<6.2	<590	<6.1	<630	<6.0	<6.2	<6.0	<6.0	2,100	$20x10^6$
Ethyl benzene	<6.0	<6.2	<590	<6.1	<630	<6.0	<6.2	<6.0	<6.0	7,700	$8x10^6$
Total xylenes	<6.0	<6.2	340J	<6.1	<630	7.5	<6.2	<6.0	<6.0	1,680	$2x10^8$

Note:

1. Recommended Soil Cleanup Objectives calculated based on 1.4% TOC in soil (NYSDEC TAGM HWR-94-4046, January 24, 1994).
2. Soil Action Level (NYSDEC TAGM #3028, November 30, 1992).
3. When the sample quantitation limit is greater than the clean-up objective, the assumed COC concentration is half of the quantitation limit.

J indicates estimated value.

UJ indicates that the analyte was not detected above the sample quantitation limit and the reported quantitation limit is an estimated quantity.

1,200 Indicates that concentration exceeds recommended soil cleanup objective

1,200 Indicates that concentration exceeds recommended soil cleanup objective *and* soil action levels

Summary of VOC Soil Analytical Results from PSA, RI, Phase II RI, and IRM, contd.

COC	Well or Borehole No., Soil Sample Depth in ft BGS, and Concentration (µg/Kg)									Cleanup Objective (µg/Kg)[1]	Action Level (µg/Kg)[2]
	S32 12'	S33 0-2'	S33 6'	S34 0-2'	S34 5'	S35 0-2'	S35 6'	S36 0-2'	S36 5'		
Vinyl chloride	<6.1	<560[3]	<6.2	<6.5	<6.1	<6.0	<10	<5.3	<5.8	200	360
Methylene chloride	<6.1	<560[3]	<6.2	<6.5	<6.1	<6.0	<10	<5.3	<5.8	150	93,000
Trichloroethene	5.6J	14,000	4.3J	1.7J	<6.1	6.2	210J	1.6J	<5.8	880	64,000
Acetone	<6.1	<560UJ[3]	<6.2UJ	5.4J	<7.4	6.3J	<14	4.6J	<5.8UJ	200	$8x10^6$
1,2-Dichloroethene (total *cis* and *trans*)	<6.1	<560[3]	<6.2	<6.5	<6.1	<6.0	33J	<5.3	<5.8	410	$2.8x10^6$ (total)
Toluene	<6.1	<560	<6.2	<6.5UJ	<6.1	<6.0	<10	<5.3UJ	<5.8	2,100	$20x10^6$
Ethyl benzene	<6.1	<560	<6.2	<6.5UJ	<6.1	<6.0	<10	<5.3UJ	<5.8	7,700	$8x10^6$
Total xylenes	<6.1	<560	<6.2	<6.5UJ	<6.1	<6.0	<10	3.3J	<5.8	1,680	$2x10^8$

Note:

1. Recommended Soil Cleanup Objectives calculated based on 1.4% TOC in soil (NYSDEC TAGM HWR-94-4046, January 24, 1994).
2. Soil Action Level (NYSDEC TAGM #3028, November 30, 1992).
3. When the sample quantitation limit is greater than the clean-up objective, the assumed COC concentration is half of the quantitation limit.

J indicates estimated value.

UJ indicates that the analyte was not detected above the sample quantitation limit and the reported quantitation limit is an estimated quantity.

1,200 Indicates that concentration exceeds recommended soil cleanup objective

1,200 Indicates that concentration exceeds recommended soil cleanup objective *and* soil action levels

Summary of VOC Soil Analytical Results from PSA, RI, Phase II RI, and IRM, contd.

COC	Well or Borehole No., Soil Sample Depth in ft BGS, and Concentration (µg/Kg)									Cleanup Objective (µg/Kg)[1]	Action Level (µg/Kg)[2]
	S37 6-8'	S37 10-12'	S37 14-16'	S38 6-8'	S38 14-16'	S39 0-2'	S39 5'	S40 0-2'	S40 10'		
Vinyl chloride	<29	<29	<570[3]	<5.9	<6.0	<5.9	<6.3	<5.7	<6.6	200	360
Methylene chloride	<29	<29	<570[3]	<5.9	<6.0	<5.9	<6.3	<5.7	<6.6	150	93,000
Trichloroethene	930	780	3,300	<5.9	6.1	160J	1.8J	2.3J	<6.6	880	64,000
Acetone	<29	<29	<570[3]	<5.9	<6.0	<5.9UJ	<6.3UJ	<5.7UJ	<6.6UJ	200	$8x10^6$
1,2-Dichloroethene (total *cis* and *trans*)	250	300	450J	<5.9	<6.0	102.5J	5.5J	1.9J	<6.6	410	$2.8x10^6$ (total)
Toluene	<29	<29	<570	<5.9	<6.0	<5.9UJ	<6.3	<5.7	<6.6	2,100	$20x10^6$
Ethyl benzene	<29	<29	<570	<5.9	<6.0	<5.9UJ	<6.3	<5.7	<6.6	7,700	$8x10^6$
Total xylenes	<29	<29	<570	<5.9	<6.0	4.6J	<6.3	<5.7	<6.6	1,680	$2x10^8$

Note:

1. Recommended Soil Cleanup Objectives calculated based on 1.4% TOC in soil (NYSDEC TAGM HWR-94-4046, January 24, 1994).
2. Soil Action Level (NYSDEC TAGM #3028, November 30, 1992).
3. When the sample quantitation limit is greater than the clean-up objective, the assumed COC concentration is half of the quantitation limit.

J indicates estimated value.

UJ indicates that the analyte was not detected above the sample quantitation limit and the reported quantitation limit is an estimated quantity.

1,200 Indicates that concentration exceeds recommended soil cleanup objective

1,200 Indicates that concentration exceeds recommended soil cleanup objective *and* soil action levels

Summary of VOC Soil Analytical Results from PSA, RI, Phase II RI, and IRM, contd.

COC	Well or Borehole No., Soil Sample Depth in ft BGS, and Concentration (µg/Kg)									Cleanup Objective (µg/Kg)[1]	Action Level (µg/Kg)[2]
	S41 0-1'	S41 6'	S42 0-4'	S42 6-8'	S43 2-3'	S43 10'	S43 12'	S44 1-2'	S44 8-10'		
Vinyl chloride	<6.2	5.8J	<11	<580[3]	<6.0	<6.0	<5.6	<6.0	<5.7	200	360
Methylene chloride	<6.2	<6.2	<11	<580[3]	<6.0	<6.0	<5.6	<6.0	<5.7	150	93,000
Trichloroethene	19	<6.2	57	1,500	6.9	16	20	<6.0	21	880	64,000
Acetone	83J	11J	8.9J	<580[3]	20J	5.3J	5.5J	21J	<5.7	200	$8x10^6$
1,2-Dichloroethene (total *cis* and *trans*)	50.5J	12	11J	400J	8.8	4.1J	4.8J	<6.0	5.1J	410	$2.8x10^6$ (total)
Toluene	2.7J	<6.2	<11	<580	<6.0	<6.0	<5.6	<6.0	<5.7	2,100	$20x10^6$
Ethyl benzene	<6.2	<6.2	<11	<580	<6.0	<6.0	<5.6	<6.0	<5.7	7,700	$8x10^6$
Total xylenes	1.2J	1.2J	<11	<580	6.2J	<6.0	<5.6	<6.0	<5.7	1,680	$2x10^8$

Note:

1. Recommended Soil Cleanup Objectives calculated based on 1.4% TOC in soil (NYSDEC TAGM HWR-94-4046, January 24, 1994).
2. Soil Action Level (NYSDEC TAGM #3028, November 30, 1992).
3. When the sample quantitation limit is greater than the clean-up objective, the assumed COC concentration is half of the quantitation limit.

J indicates estimated value.

UJ indicates that the analyte was not detected above the sample quantitation limit and the reported quantitation limit is an estimated quantity.

1,200 Indicates that concentration exceeds recommended soil cleanup objective

1,200 Indicates that concentration exceeds recommended soil cleanup objective *and* soil action levels

Summary of VOC Soil Analytical Results from PSA, RI, Phase II RI, and IRM, contd.

COC	Well or Borehole No., Soil Sample Depth in ft BGS, and Concentration (µg/Kg)									Cleanup Objective (µg/Kg)[1]	Action Level (µg/Kg)[2]
	S44 12-14'	S45 1-2'	S45 5'	S46 3-4'	S46 5'	S47 6-8'	S47 14-16'	S48 2-4'	S48 10-12'		
Vinyl chloride	<5.8	<6.8	<6.0	<610[3]	<6.1	<6.1	<5.7	<5.8	230	200	360
Methylene chloride	<5.8	<6.8	<6.0	<610[3]	<6.1	<6.1	<5.7	<5.8	<30	150	93,000
Trichloroethene	18	<6.8	<6.0	<610	<6.1	<6.1	20J	<5.8	220	880	64,000
Acetone	7.7J	<96	26J	<610UJ[3]	20J	<6.1	5.2J	76J	<30	200	$8x10^6$
1,2-Dichloroethene (total *cis* and *trans*)	3.0J	<6.8	<6.0	<610[3]	<6.1	<6.1	5.6J	8.1	1,100	410	$2.8x10^6$ (total)
Toluene	<5.8	1.4J	<6.0	<610	<6.1	<6.1	<5.7	<5.8	<30	2,100	$20x10^6$
Ethyl benzene	<5.8	14J	<6.0	2500	<6.1	<6.1	<5.7	<5.8	<30	7,700	$8x10^6$
Total xylenes	<5.8	58J	<6.0	10,000	1.8J	<6.1	<5.7	<5.8	<30	1,680	$2x10^8$

Note:

1. Recommended Soil Cleanup Objectives calculated based on 1.4% TOC in soil (NYSDEC TAGM HWR-94-4046, January 24, 1994).
2. Soil Action Level (NYSDEC TAGM #3028, November 30, 1992).
3. When the sample quantitation limit is greater than the clean-up objective, the assumed COC concentration is half of the quantitation limit.

J indicates estimated value.

UJ indicates that the analyte was not detected above the sample quantitation limit and the reported quantitation limit is an estimated quantity.

1,200 Indicates that concentration exceeds recommended soil cleanup objective

1,200 Indicates that concentration exceeds recommended soil cleanup objective *and* soil action levels

Summary of VOC Soil Analytical Results from PSA, RI, Phase II RI, and IRM, contd.

COC	Well or Borehole No., Soil Sample Depth in ft BGS, and Concentration (µg/Kg)									Cleanup Objective (µg/Kg)[1]	Action Level (µg/Kg)[2]
	S48 14-16'	S49 6-8'	S49 10-12'	S49 14-16'	S50 2-4'	S50 6-8'	S50 14-16'	S51 2-4'	S51 10-12'		
Vinyl chloride	31	34	28	180	16J	<610[3]	<600[3]	<600[3]	<640[3]	200	360
Methylene chloride	<7.9	<6.2	<22	<19	<22	<610[3]	<600[3]	<600[3]	<640[3]	150	93,000
Trichloroethene	280	45	790	620	220	1,800	850	3,500	3,600	880	64,000
Acetone	18J	13J	<22	24J	<22	<610UJ[3]	<600UJ[3]	<600UJ[3]	<640UJ[3]	200	$8x10^6$
1,2-Dichloroethene (total *cis* and *trans*)	80J	160	424	1,720	830	2,700	1,200	5,500	4,700	410	$2.8x10^6$ (total)
Toluene	<7.9	<6.2	<22	<19	<22	<610	<600	<600	<640	2,100	$20x10^6$
Ethyl benzene	<7.9	<6.2	<22	<19	<22	<610	<600	<600	<640	7,700	$8x10^6$
Total xylenes	<7.9	<6.2	<22	<19	<22	<610	<600	<600	<640	1,680	$2x10^8$

Note:

1. Recommended Soil Cleanup Objectives calculated based on 1.4% TOC in soil (NYSDEC TAGM HWR-94-4046, January 24, 1994).
2. Soil Action Level (NYSDEC TAGM #3028, November 30, 1992).
3. When the sample quantitation limit is greater than the clean-up objective, the assumed COC concentration is half of the quantitation limit.

J indicates estimated value.

UJ indicates that the analyte was not detected above the sample quantitation limit and the reported quantitation limit is an estimated quantity.

1,200 Indicates that concentration exceeds recommended soil cleanup objective

1,200 Indicates that concentration exceeds recommended soil cleanup objective *and* soil action levels

Summary of VOC Soil Analytical Results from PSA, RI, Phase II RI, and IRM, contd.

COC	Well or Borehole No., Soil Sample Depth in ft BGS, and Concentration (µg/Kg)									Cleanup Objective (µg/Kg)[1]	Action Level (µg/Kg)[2]
	S54 2-3'	S54 6'	S55 2.5'	S55 6'	S56 8'	S56 12'	S56 15'	S57 2-4'	S57 6-8'		
Vinyl chloride	<10	<6.5	<6.1	<6.2	<13	<600[3]	<590[3]	<6.0	14	200	360
Methylene chloride	<10	<6.5	<6.1	<6.2	<13	<600[3]	<590[3]	<6.0	<7.0	150	93,000
Trichloroethene	3.1J	4.0J	66	27	320	3,800	350J	<6.0	<7.0	880	64,000
Acetone	<30	12J	120J	4.8J	9.6J	<600UJ[3]	<590UJ[3]	19J	19J	200	$8x10^6$
1,2-Dichloroethene (total *cis* and *trans*)	<10	2.3J	26	2.3J	152.7J	1,700	2,300	<6.0	170J	410	$2.8x10^6$ (total)
Toluene	<10	<6.5	3.2J	<6.2	<13	<600	<590	<6.0	<7.0	2,100	$20x10^6$
Ethyl benzene	11J	2.7J	8.0	<6.2	<13	910	590J	<6.0	<7.0	7,700	$8x10^6$
Total xylenes	5.2J	<6.5	16	<6.2	<13	540J	<590	<6.0	<7.0	1,680	$2x10^8$

Note:

1. Recommended Soil Cleanup Objectives calculated based on 1.4% TOC in soil (NYSDEC TAGM HWR-94-4046, January 24, 1994).
2. Soil Action Level (NYSDEC TAGM #3028, November 30, 1992).
3. When the sample quantitation limit is greater than the clean-up objective, the assumed COC concentration is half of the quantitation limit.

J indicates estimated value.

UJ indicates that the analyte was not detected above the sample quantitation limit and the reported quantitation limit is an estimated quantity.

1,200 Indicates that concentration exceeds recommended soil cleanup objective

1,200 Indicates that concentration exceeds recommended soil cleanup objective *and* soil action levels

Summary of VOC Soil Analytical Results from PSA, RI, Phase II RI, and IRM, contd.

COC	Well or Borehole No., Soil Sample Depth in ft BGS, and Concentration (µg/Kg)									Cleanup Objective (µg/Kg)[1]	Action Level (µg/Kg)[2]
	S57 14-16'	S58 0-2'	S58 6'	S59 0-2'	S59 6'	S59 8-9'	S59 12'	S60 2-4'	S60 6-8'		
Vinyl chloride	62	<6.6	<6.1	<6.2	<5.9	<6.2	<5.6	<6.0	<5.8	200	360
Methylene chloride	<16	<6.6	<6.1	<6.2	<5.9	<6.2	<5.6	<6.0	<5.8	150	93,000
Trichloroethene	28	32J	54	17J	2.6J	22	1.9J	<6.0	<5.8	880	64,000
Acetone	30J	7.0J	6.9J	<130	21J	<6.2	11	35J	<5.8	200	$8x10^6$
1,2-Dichloroethene (total *cis* and *trans*)	640	74.8J	57	5.0J	3.4J	6.2	4.3J	<6.0	<5.8	410	$2.8x10^6$ (total)
Toluene	<16	<6.6	<6.1	<6.2	<5.9	<6.2	<5.6	<6.0	<5.8	2,100	$20x10^6$
Ethyl benzene	<16	<6.6	<6.1	<6.2	<5.9	<6.2	<5.6	<6.0	<5.8	7,700	$8x10^6$
Total xylenes	<16	<6.6	<6.1	<6.2	<5.9	9.1	<5.6	<6.0	<5.8	1,680	$2x10^8$

Note:

1. Recommended Soil Cleanup Objectives calculated based on 1.4% TOC in soil (NYSDEC TAGM HWR-94-4046, January 24, 1994).
2. Soil Action Level (NYSDEC TAGM #3028, November 30, 1992).
3. When the sample quantitation limit is greater than the clean-up objective, the assumed COC concentration is half of the quantitation limit.

J indicates estimated value.

UJ indicates that the analyte was not detected above the sample quantitation limit and the reported quantitation limit is an estimated quantity.

1,200 Indicates that concentration exceeds recommended soil cleanup objective

1,200 Indicates that concentration exceeds recommended soil cleanup objective *and* soil action levels

Summary of VOC Soil Analytical Results from PSA, RI, Phase II RI, and IRM, contd.

COC	Well or Borehole No., Soil Sample Depth in ft BGS, and Concentration (µg/Kg)									Cleanup Objective (µg/Kg)[1]	Action Level (µg/Kg)[2]
	S61 2-4'	S61 6-8'	S62 1-2'	S62 4-6'	S63 1-2'	S63 6-8'	S64 1-2'	S64 4-6'			
Vinyl chloride	<5.7	<5.7	<5.6	<5.9	<6.0	<6.0	<5.7	<5.8		200	360
Methylene chloride	<5.7	<5.7	<5.6	<5.9	<6.0	<6.0	<5.7	<5.8		150	93,000
Trichloroethene	<5.7	2.5J	<5.6	<5.9	<6.0	<6.0	<5.7	<5.8		880	64,000
Acetone	28J	9.0J	11J	<5.9	<6.0	<6.0	22J	<5.8		200	$8x10^6$
1,2-Dichloroethene (total *cis* and *trans*)	<5.7	<5.7	<5.6	<5.9	<6.0	<6.0	<5.7	<5.8		410	$2.8x10^6$ (total)
Toluene	<5.7	<5.7	<5.6	<5.9	<6.0	<6.0	<5.7	<5.8		2,100	$20x10^6$
Ethyl benzene	<5.7	<5.7	<5.6	<5.9	<6.0	<6.0	<5.7	<5.8		7,700	$8x10^6$
Total xylenes	<5.7	<5.7	<5.6	<5.9	<6.0	<6.0	<5.7	<5.8		1,680	$2x10^8$

Note:

1. Recommended Soil Cleanup Objectives calculated based on 1.4% TOC in soil (NYSDEC TAGM HWR-94-4046, January 24, 1994).
2. Soil Action Level (NYSDEC TAGM #3028, November 30, 1992).
3. When the sample quantitation limit is greater than the clean-up objective, the assumed COC concentration is half of the quantitation limit.

J indicates estimated value.

UJ indicates that the analyte was not detected above the sample quantitation limit and the reported quantitation limit is an estimated quantity.

1,200 Indicates that concentration exceeds recommended soil cleanup objective

1,200 Indicates that concentration exceeds recommended soil cleanup objective *and* soil action levels

Summary of PAH Soil Analytical Results from PSA, RI, Phase II RI, and IRM

COC	Well or Borehole No., Soil Sample Depth in ft BGS, and Concentration (µg/Kg)									Cleanup Objective (µg/Kg)[1]
	MW-6 0-2'	MW-6 10-12'	MW-7b 0-2'	MW-7b 16-18'	S-5 0-2'	S-18 0-2'	S-18 12-14'	S-19 2-4'	S-19 16-18'	
Acenaphthylene	<300	<300	<300	<300	2,600	<3,000	<300	<300	<600	128,000
Anthracene	2,000	<300	<300	<300	5,200J	33,000	<300	<300	2,300	980,000
Benzo(a)anthracene	6,900	<300	<300	<300	14,000J	22,000	<300	<300	<600	3,860
Benzo(a)pyrene	<1,500	<1,500	<1,500	<1,500	11,000J	<15,000	<1,500	<1,500	<3,000	15,400
Benzo(b)fluoranthene	<300	<300	<300	<300	14,000J	<3,000[(2)]	<300	<300	<600	1,500
Benzo(k)fluoranthene	<300	<300	<300	<300	6,700J	<3,000[(2)]	<300	<300	<600	1,500
Chrysene	11,000	<300	<300	<300	14,000J	32,000	<300	<300	<600[(2)]	560
Fluoranthene	-	-	-	-	27,000J	37,000	<300	<300	800	2.66×10^6
Fluorene	720	<300	<300	<300	4,900J	5,100	<300	<300	<600	511,000
Indeno(1,2,3-cd)pyrene	<1,500	<1,500	<1,500	<1,500	6,400J	<15,000[(2)]	<1,500	<1,500	<3,000	4,480
Naphthalene	340	<300	<300	<300	4,300J	3,900	<300	<300	<600	182,000
Phenanthrene	7,500	<300	<300	<300	28,000J	<3,000	<300	<300	<600	305,000
Pyrene	17,000	<300	<300	<300	23,000J	35,000	<300	<300	750	930,000

Note:

1. Recommended Soil Cleanup Objectives calculated based on 1.4% TOC in soil (NYSDEC TAGM HWR-94-4046, January 24, 1994).
2. When the sample quantitation limit is greater than the clean-up objective, the assumed COC concentration is half of the quantitation limit.

J indicates estimated value.

UJ indicates that the analyte was not detected above the sample quantitation limit and the reported quantitation limit is an estimated quantity.

1,200 Indicates that concentration exceeds recommended soil cleanup objective

Summary of PAH Soil Analytical Results from PSA, RI, Phase II RI, and IRM, contd.

COC	Well or Borehole No., Soil Sample Depth in ft BGS, and Concentration (µg/Kg)									Cleanup Objective (µg/Kg)[1]
	S-33 0-2'	S-33 6'	S-34 0-2'	S-34 5'	S-35 0-2'	S-35 6'	S-36 0-2'	S-36 5'		
Acenaphthylene	1,200J	24J	<14,000UJ	<390UJ	<410UJ	<410UJ	770J	<370UJ		128,000
Anthracene	17,000J	160J	12,000J	<390UJ	<410UJ	<410UJ	17,000J	<370UJ		980,000
Benzo(a)anthracene	36,000	420	26,000	<390	<410	<410	35,000	42J		3,860
Benzo(a)pyrene	31,000J	450J	26,000J	<390UJ	<410UJ	<410UJ	41,000J	57J		15,400
Benzo(b/k)fluoranthene	47,000	730	35,000	<390	<410	<410	53,000	75J		1,500
Chrysene	36,000J	460J	27,000J	<390UJ	<410UJ	<410UJ	36,000J	47J		560
Fluoranthene	81,000J	980J	51,000J	<390UJ	<410UJ	<410UJ	66,000J	85J		$2.66x10^6$
Fluorene	7,400J	73J	3,500J	<390UJ	<410UJ	<410UJ	7,000J	<370UJ		511,000
Indeno(1,2,3-cd)pyrene	22,000	390J	18,000	<390	<410	<410	29,000	36J		4,480
Naphthalene	6,500J	58J	2,100J	<390UJ	<410UJ	<410UJ	12,000J	<370UJ		182,000
Phenanthrene	55,000J	640J	38,000J	<390UJ	<410UJ	<410UJ	49,000J	61J		305,000
Pyrene	83,000J	960J	58,000J	<390UJ	<410UJ	<410UJ	76,000J	82J		930,000

Note:

1. Recommended Soil Cleanup Objectives calculated based on 1.4% TOC in soil (NYSDEC TAGM HWR-94-4046, January 24, 1994).
2. When the sample quantitation limit is greater than the clean-up objective, the assumed COC concentration is half of the quantitation limit.

J indicates estimated value.

UJ indicates that the analyte was not detected above the sample quantitation limit and the reported quantitation limit is an estimated quantity.

1,200 Indicates that concentration exceeds recommended soil cleanup objective

APPENDIX B

Summary of Groundwater Sampling

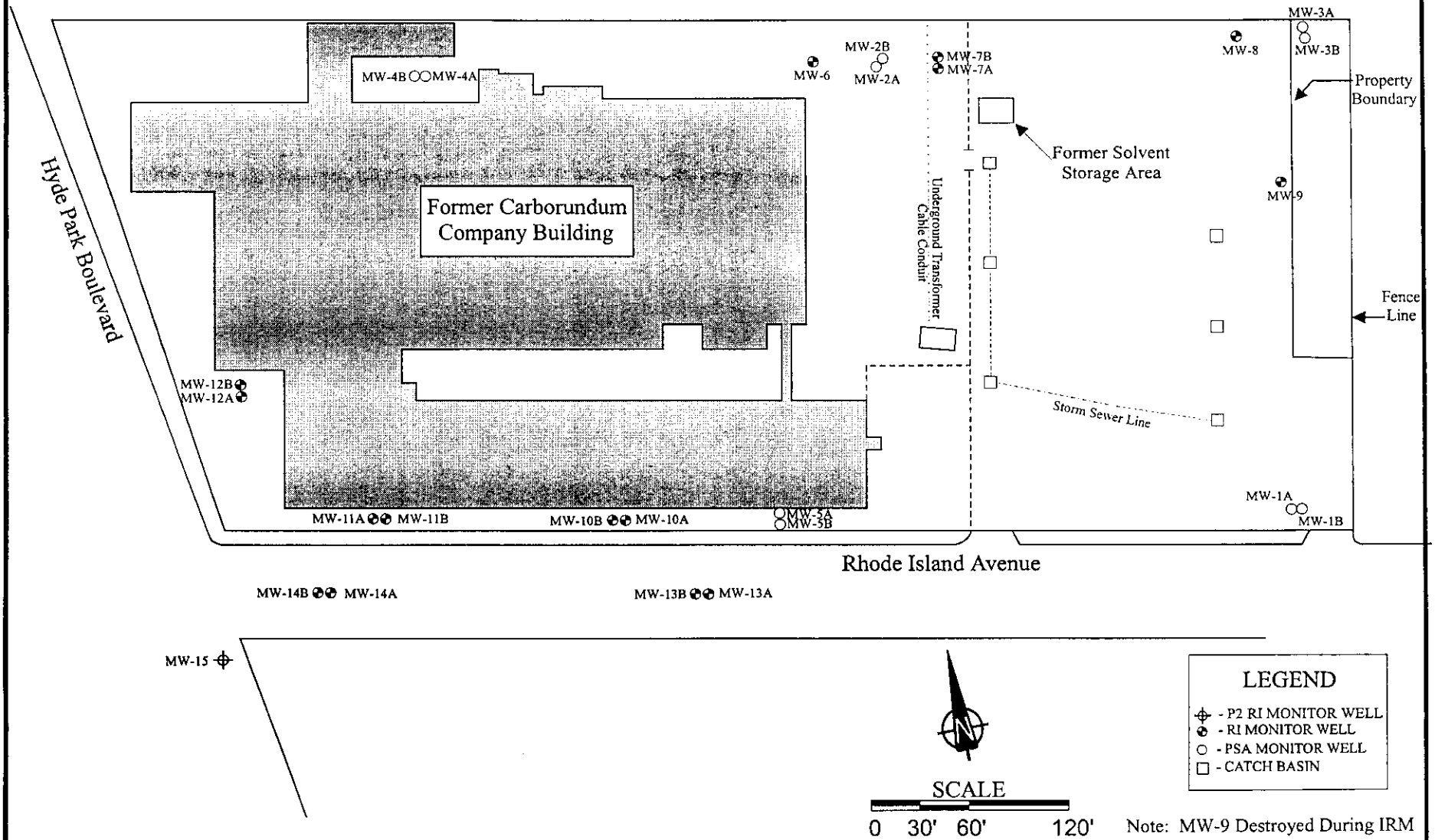


Figure B-1	Job #: TM4085	Groundwater Sampling Locations	Duke Engineering & Services (Canada), Inc. A Duke Energy Company
Date: January 14, 2000	Drawn/File Name: MSM/B_1wells.cdr	Former Carborundum Company - Electric Products Division	3075 14th Avenue, Suite 207 Markham, Ontario Canada L3R 0G9 (905) 513-9400 fax (905) 513-9405

Table B-1 Groundwater Analytical Results

Contaminant Of Concern	Well ID, Sample Date and Concentration (µg/L)												Water Quality Standard (µg/L)	
	MW-1A		MW-1B		MW-2A		MW-2B		MW-3A		MW-3B			
	8/92	11/97	8/92	11/97	8/92	11/97	8/92	11/97	8/92	11/97	8/92	11/97	1.	2.
Vinyl chloride	2J	<2	<10	<2	<10	<2J	**66**	**59J**	<10	<2	**5**	<2J	**2**	
cis- and trans-1,2-dichloroethene	**14**	<5	**10**	<5	<10	<5J	**2300**	**450J**	<10	<5	**18**	5J		**5**
Trichloroethene	<10	<5	<10	<5	<10	<5J	**670**	**6J**	4J	<5	<10	<5J		**5**
Benzene	<10	<0.7	<10	<0.7	<10	<0.7J	1J	<0.7J	<10	<5	0.6J	<5J	**0.7**	
1,1-dichloroethane	2J	<5	3J	<5	3J	**12J**	<10	<5J	<10	<0.7	<10	<0.7J		**5**

Note: 1. NYSDEC (1991) (6NYCRR Part 703)
2. NYSDEC (1991) (TOGS 1.1.1)
* well located on upgradient boundary

J indicates estimated value

1200 indicates that concentration exceeds water quality standard

Wells MW-1A, 1B, 2A, 2B, 3A, 3B, 4A, 4B, 5A, and 5B sampled August 1992 during the Preliminary Site Assessment

Wells MW-6, 7A, 7B, 8, 9, 10A, 10B, 11A, 11B, 12A, 12B, 13A, 13B, 14A, and 14B sampled May 1996 during the Remedial Investigation

All wells sampled November 1997 during the Phase II Remedial Investigation

Table B-1 Groundwater Analytical Results (continued)

Contaminant Of Concern	Well ID, Sample Date and Concentration (µg/L)												Water Quality Standard (µg/L)	
	MW-4A		MW-4B		MW-5A		MW-5B		MW-6*		MW-7A*			
	8/92	11/97	8/92	11/97	8/92	11/97	8/92	11/97	5/96	11/97	5/96	11/97	1.	2.
Vinyl chloride	**13**	**32J**	**26**	**22**	**1300**	**14**	**75**	**33J**	<100	**68J**	<1000	**11J**	2	
cis- and trans-1,2-dichloroethene	**230**	**49J**	**130**	**45**	**1900**	**110**	**520**	**270J**	**1000**	**595J**	**1200**	**5206J**		5
Trichloroethene	3J	<5J	5J	<5	<200	<5	**71**	5J	<100	<5J	**8700**	**1400J**		5
Benzene	<10	<5J	<10	<0.7	<200	<0.7	<10	<0.7J	<100	<0.7J	<1000	**4J**	0.7	
1,1-dichloroethane	2J	<0.7J	<10	2J	<200	<5	3J	<5J	<100	<5J	<100	**1500J**		5

Note: 1. NYSDEC (1991) (6NYCRR Part 703)
2. NYSDEC (1991) (TOGS 1.1.1)
* well located on upgradient boundary

J indicates estimated value

1200 indicates that concentration exceeds water quality standard

Wells MW-1A, 1B, 2A, 2B, 3A, 3B, 4A, 4B, 5A, and 5B sampled August 1992 during the Preliminary Site Assessment

Wells MW-6, 7A, 7B, 8, 9, 10A, 10B, 11A, 11B, 12A, 12B, 13A, 13B, 14A, and 14B sampled May 1996 during the Remedial Investigation

All wells sampled November 1997 during the Phase II Remedial Investigation

Table B-1 Groundwater Analytical Results (continued)

Contaminant Of Concern	Well ID, Sample Date and Concentration (µg/L)												Water Quality Standard (µg/L)	
	MW-7B*		MW-8*		MW-9		MW-10A		MW-10B		MW-11A			
	5/96	11/97	5/96	11/97	5/96	11/97	5/96	11/97	5/96	11/97	5/96	11/97	1.	2.
vinyl chloride	<100	**23J**	<10	<2J	<10	**4J**	**38J**	**65**	**120J**	**52**	<10	<2	2	
cis- and trans-1,2-dichloroethene	**370**	**110J**	<10	**6J**	**11**	**6J**	**690**	**1212**	**1900**	**921**	<10	<5		5
Trichloroethene	<100	<5J	<10	<5J	<10	<5J	<250	<5	**90J**	**28**	<10	<5		5
Benzene	<100	<0.7J	<10	<0.7J	<10	<0.7J	<250	<0.7	<250	<0.7	<10	<0.7	0.7	
1,1-dichloroethane	<100	<5J	<10	<5J	<10	<5J	<250	**18**	<250	<5	<10	<5		5

Note: 1. NYSDEC (1991) (6NYCRR Part 703)
2. NYSDEC (1991) (TOGS 1.1.1)
* well located on upgradient boundary

J indicates estimated value

1200 indicates that concentration exceeds water quality standard

Wells MW-1A, 1B, 2A, 2B, 3A, 3B, 4A, 4B, 5A, and 5B sampled August 1992 during the Preliminary Site Assessment

Wells MW-6, 7A, 7B, 8, 9, 10A, 10B, 11A, 11B, 12A, 12B, 13A, 13B, 14A, and 14B sampled May 1996 during the Remedial Investigation

All wells sampled November 1997 during the Phase II Remedial Investigation

Table B-1 Groundwater Analytical Results (continued)

Contaminant Of Concern	Well ID, Sample Date and Concentration (µg/L)												Water Quality Standard (µg/L)	
	MW-11B		MW-12A		MW-12B		MW-13A		MW-13B		MW-14A			
	5/96	11/97	5/96	11/97	5/96	11/97	5/96	11/97	5/96	11/97	5/96	11/97	1.	2.
vinyl chloride	<50	**56**	**13J**	**14J**	**16J**	**53J**	<10	<2J	<100	**31J**	<10	<2J	2	
cis- and trans-1,2-dichloroethene	**390**	**705J**	**430**	**120J**	**250**	**250J**	<10	<5J	**810**	**410J**	<10	<5J		5
Trichloroethene	<50	<5	<50	<5J	**18J**	<5J	<10	<5J	**48J**	**36**	<10	<5J		5
Benzene	<50	<0.7	<50	<0.7J	<50	<0.7J	<10	<0.7J	<100	<1J	<10	<0.7J	0.7	
1,1-dichloroethane	<50	<5	<50	<5J	<50	<5J	<10	<5J	<100	<10J	<10	<5J		5

Note: 1. NYSDEC (1991) (6NYCRR Part 703)
2. NYSDEC (1991) (TOGS 1.1.1)
* well located on upgradient boundary

J indicates estimated value

1200 indicates that concentration exceeds water quality standard

Wells MW-1A, 1B, 2A, 2B, 3A, 3B, 4A, 4B, 5A, and 5B sampled August 1992 during the Preliminary Site Assessment

Wells MW-6, 7A, 7B, 8, 9, 10A, 10B, 11A, 11B, 12A, 12B, 13A, 13B, 14A, and 14B sampled May 1996 during the Remedial Investigation

All wells sampled November 1997 during the Phase II Remedial Investigation

Table B-1 Groundwater Analytical Results (continued)

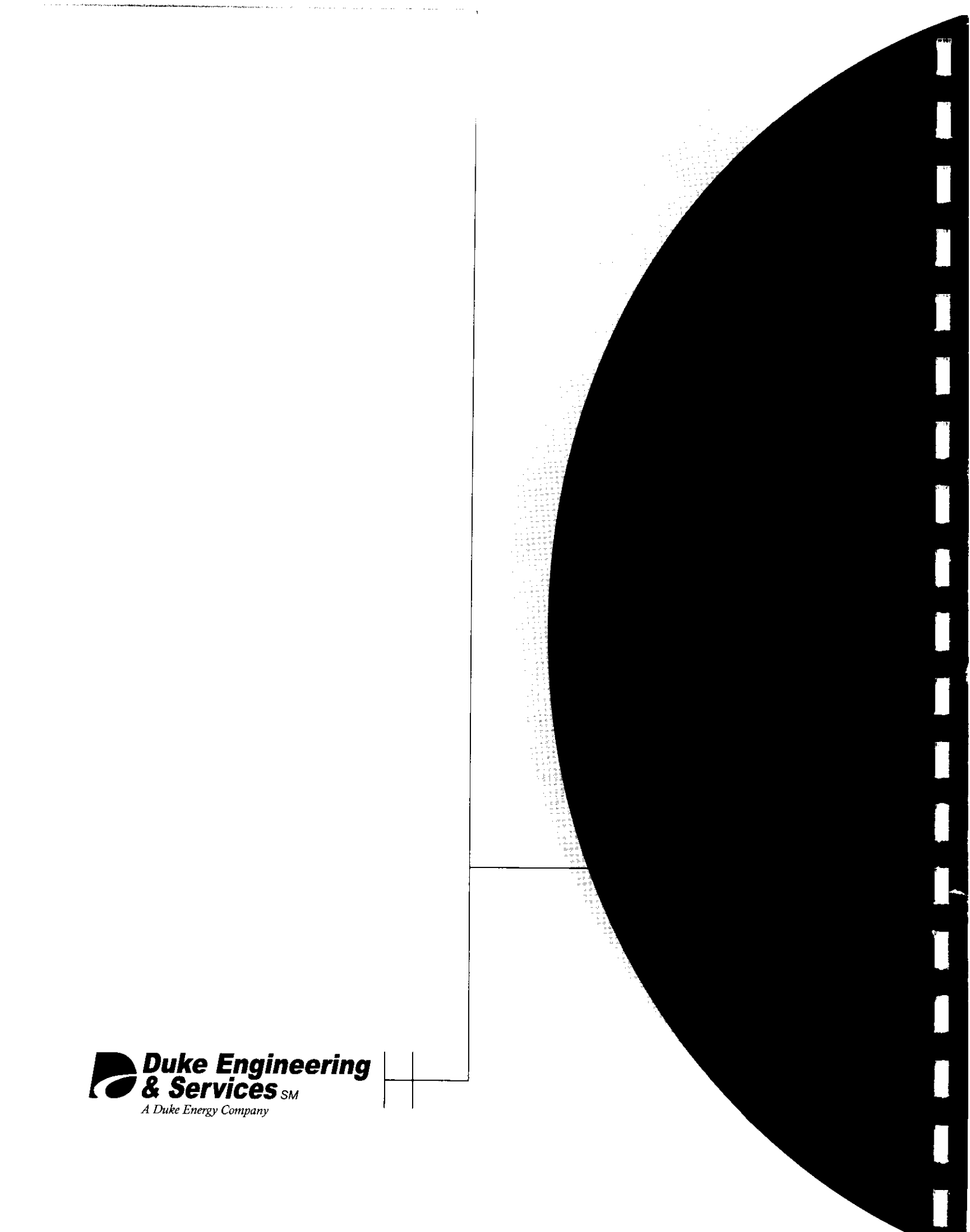
Contaminant of Concern	Well ID, Sample Date and Concentration (µg/L)				Water Quality Standard (µg/L)	
	MW-14B		MW-15			
	5/96	11/97	5/96	11/97	1.	2.
Vinyl chloride	<50	65J	n/a	68	2	
cis- and trans-1,2-dichloroethene	310	765J	n/a	640		5
Trichloroethene	<50	<5J	n/a	<10		5
benzene	<50	<0.7J	n/a	<1	0.7	
1,1-dichloroethane	<50	<5J	n/a	<10		5

Note: 1. NYSDEC (1991) (6NYCRR Part 703)
2. NYSDEC (1991) (TOGS 1.1.1)
* well located on upgradient boundary

J indicates estimated value

1200 indicates that concentration exceeds water quality standard

Wells MW-1A, 1B, 2A, 2B, 3A, 3B, 4A, 4B, 5A, and 5B sampled August 1992 during the Preliminary Site Assessment
Wells MW-6, 7A, 7B, 8, 9, 10A, 10B, 11A, 11B, 12A, 12B, 13A, 13B, 14A, and 14B sampled May 1996 during the Remedial Investigation. All wells sampled November 1997 during the Phase II Remedial Investigation.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Feasibility Study for the Remediation of the Former Carborundum Company -Electric Products Division, Hyde Park Facility Town of Niagara, Niagara County, New York SITE NO. 932036

FINAL DOCUMENT

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44114-2375

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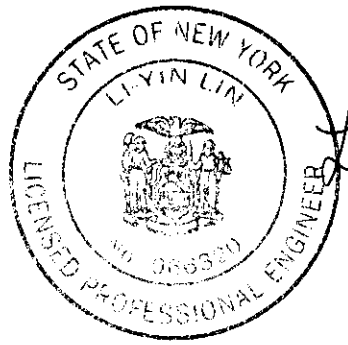

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January 2000